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A Novel Ship Parachute

by NICK SOFTIS

Inventor of the ship type parachute described here.

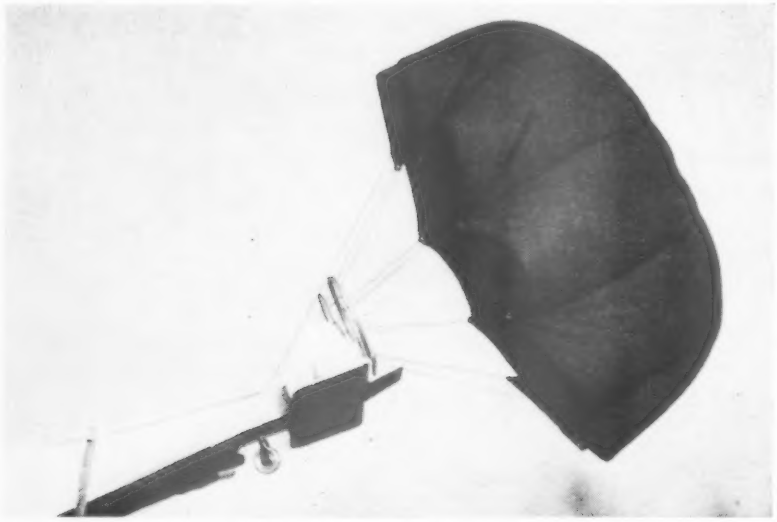

Fig. 1. Here the parachute has just been released, the 'chute is inflated and the shroud-lines are partly payed out. Note the shroud-line guide rings at the tail of the plane.

SEVERAL years ago our government, some foreign countries and several aviation enterprises and individuals were conducting experiments for the purpose of developing some assured means of releasing or launching a large parachute to lower the entire plane and its occupants safely to earth when the plane was disabled in flight.

These experiments and others, so far tried, proved impracticable and uncertain, primarily because of the difficulties encountered in successfully launching a large parachute from a speeding plane.

In all these previous experiments, the 'chute was released and ejected with high-tension springs from the top and the center of the fuselage. This proved to be very risky because of the possibilities of the 'chute and shroud lines becoming entangled or fouled upon the tail-group, which portion assumes an uppermost position when the plane is falling.

In several of these previous tests, success was attained by ejecting the cloth and shroud-lines high enough to clear the tail of the plane, but, when and *if* the parachute did open with a "pop," the plane received such a terrific jolt that it was a very dangerous proceeding.

One really has to stretch his imagination to visualize this great first jolt that the plane receives when the 'chute opens instantaneously and checks the fall of a dead weight of several thousand pounds at high speed. And, to withstand this terrific jolt, heavier fabric for the 'chute is required and a considerably greater number of shroud lines which, of course, adds to the weight and cost of the parachute.

After following those experiments closely, and realizing the difficulties that were encountered, I was tempted to work along new lines in developing something that would be more practical and reliable.

And now, after several years of continuous effort and hard work, I believe that something valuable and useful to aviation has been realized. A different and altogether new method of launching a parachute has been devised, which positively assures two most important objectives as follows:

First. The opening of the 'chute is so simply arranged (details of which will follow), that it is almost impossible for it to foul or fail to open.

Second. It will check the drop of the plane with a gradually increasing cushioned resistance applied to the shroud-lines while 'chute is opening, thus eliminating that terrific jolt which was previously mentioned.

In this new device, the 'chute is carried and packed at the tail end of the plane and is released from that point. The 'chute (fabric only) is packed in a round or oval basket consisting of two metal rings, very light in weight, the upper ring being larger than the lower. The bottom of this basket is crossed with fine lacings to hold the cloth and permit the air to pass through freely.

The upper ring protrudes a little to the outer side, while openings are provided and equally distributed around the ring for each shroud-line of the 'chute. The lines run through these openings freely and separately. The basket, with the ring in which 'chute is packed, is snapped with spring clamps on the outer side of a hinged horseshoe bracket, this bracket being secured to the plane at the extreme rear end of the space provided at the rear of the plane.

The shroud-lines of the 'chute are wound upon a windlass. This windlass is placed at the front end of the space provided for the device and forward of the bracket holding the ring and 'chute. This bracket, being on spring hinges, is pressed down into the space at the rear

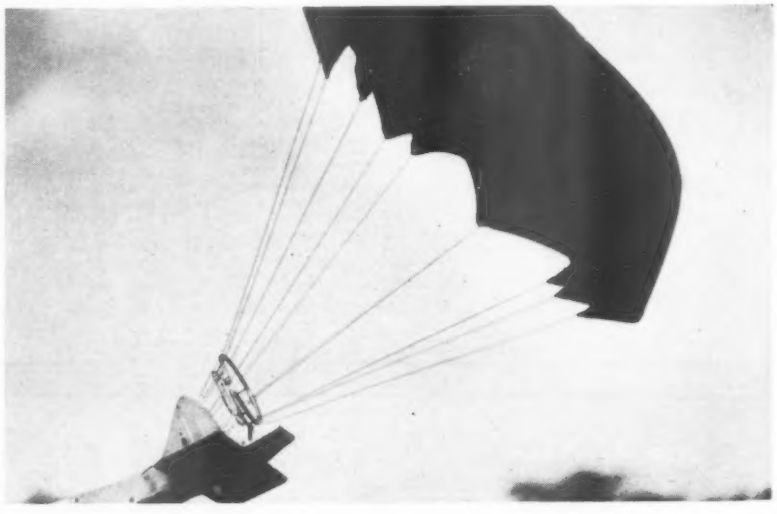

Fig. 2. The shroud-lines are now about three-quarters out while the ring can be seen still guiding the shroud-lines as they are unwinding from the windlass. There is no danger of the lines becoming entangled.

Promises to Aid Airliners

end of fuselage and is held down in that position by a top cover or door which is streamlined with the rest of the fuselage and offers no wind resistance to the plane when the parachute is packed and not in use.

When the pilot encounters trouble and has to make a forced landing at a place, where a forced landing would result in disaster, he pulls a release that throws the top door off and clear of the plane. The bracket holding the ring basket and 'chute now assumes an upright position.

The small model, experimented with, was arranged with one solid door, as it was easier to construct, but on the actual airplane, a split door can be arranged, opening and hinged to the sides, which will not interfere with the operation of the 'chute and the door need not be thrown away.

Due to the forward speed of the plane, air rushes through the lacings at the bottom of the ring and instantly inflates the 'chute, while the shroud-lines are held tensely wound around the windlass when the 'chute is filled, naturally exerting a pull on the shroud-lines. The windlass now begins to feed out the lines gradually and with an increasing resistance.

The windlass is directly connected with two gears to a push-rod. This push-rod, as the windlass rotates, is pressed against a coil spring, creating gradually increasing resistance. By this arrangement, the windlass yieldingly opposes the outward movement of the shroud-lines and thus prevents damage to the plane and occupants by cushioning the shock.

The coil spring is placed in a tube to prevent buckling, hence the size of spring will naturally vary according to the size of 'chute and weight of plane.

At the lower end of the shroud-lines, small ball-stops are tied, one ball-stop to every three or four of the shroud lines, equally divided around. When these ball stops reach the ring, being a little larger than the openings provided for the shroud lines to run through, they jerk the ring away from the horseshoe bracket upon which the ring was held by the spring clamps.

This ring is carried along on the 'chute at the lower part of shroud lines and rests on the ball-stops. Instantly, after the ring is jerked out of a swivel arrangement, the lock-key disengages the extreme lower end of the shroud lines from the windlass and a single cable is extended to the front end of plane or center of gravity from which point craft is lowered *affording a three-point landing.*

One can easily see, by this arrangement for releasing the 'chute, that there is absolutely no delay whatsoever. The "mouth" of the 'chute, being held open by the ring, fills up instantly—not a second is lost—and starts to check the drop of the plane instantaneously.

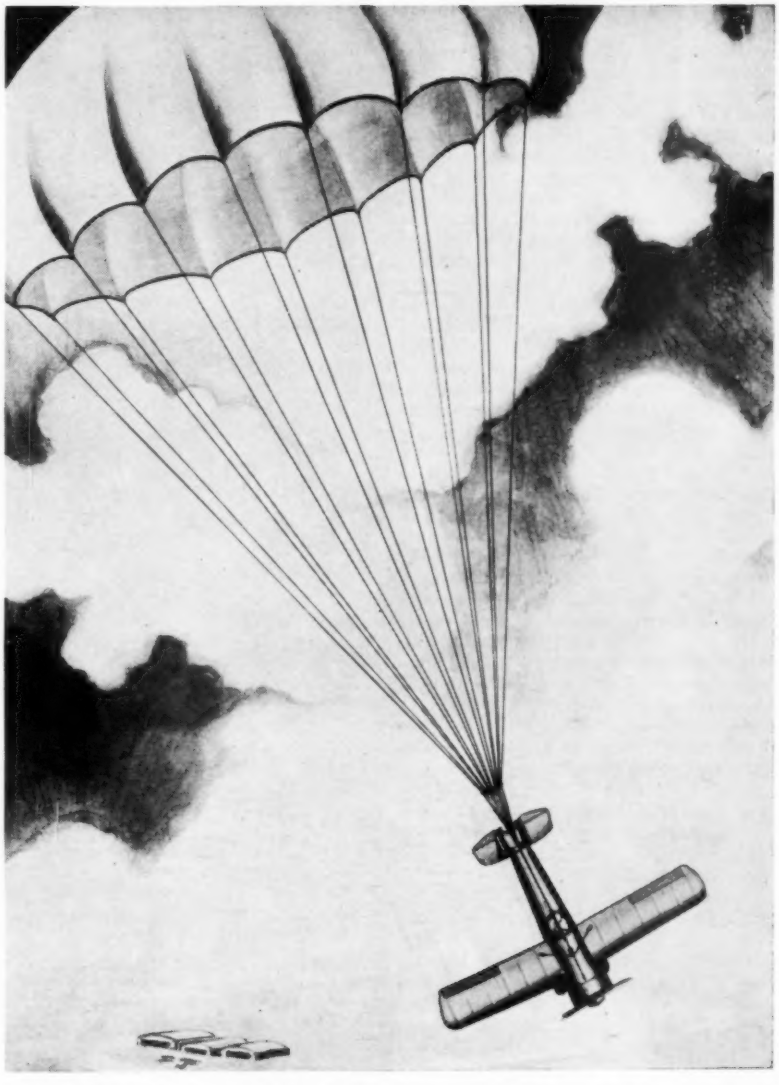

Fig. 3. This artists' drawing shows the shroud lines drawn out to their full length and the ring jerked away from its bracket. The swivel and lock-key arrangements are about to be disengaged from the windlass.

In all previous experiments, the entire 'chute and shroud-lines were dumped out in a bundle and the full length of the 'chute and shroud-lines had to be unfurled by the wind, slapping the cloth and lines into all shapes and forms. Then, the plane had to drag the 'chute for several hundred feet before air would work in between the flaps to open it (if it opened at all).

Our government, today, compels all their pilots to carry small parachutes while flying and many others use them. They are considered a great development and an asset to the aviation industry, having proved their value in saving many lives. Some of our greatest flyers of today owe their lives to them. Why not a larger parachute with only a slight additional cost and weight to save many more lives and the craft itself?

The loss of airplanes, that have crashed and have been completely destroyed so far, amounts to millions of dollars, not including the lives lost because we can never place a fixed money value on a human life.

The aviation industry, by adopting a safety device for airplanes will increase the number of privately owned planes, when lives and property are assured. The passenger airlines will increase confidence in air travel, besides protecting their investments from a total loss and

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save considerably large sums on their insurance rates.

Aviation travel is the coming thing in modern times when speed is very important. We like to do things fast and travel fast in this fast travel era, but we must first sell aviation travel to the public by providing convincing safety.

Information gathered so far, by reliable sources, discloses the fact that a large parachute, sixty feet in diameter, is capable of lowering a plane weighing 5,000 pounds. The weight of a sixty-foot diameter 'chute is only fifty-five pounds.

Adding the additional mechanism such as the ring, bracket, windlass and coil spring, will not increase this more than fifteen pounds with probably another fifteen pounds for miscellaneous changes and adjustments to the plane, making a total extra weight of eighty-five pounds. This small additional weight is required for a plane weighing 5,000 pounds.

On approaching the Department of Commerce, Bureau of Air Commerce, in respect to this device I was told that the airplane does not need it, for the simple reason that *all* airplane accidents occur too close to the ground for the 'chute to be of any value. This statement is very misleading. Then why not discard the small parachute and save that additional expense? Many army flyers have jumped from high altitudes and saved their lives with the small parachute. As long as a small 'chute is useful in saving the pilot only, how is it that a large 'chute, with my device (which I am positive will open much faster and with more certainty than the small 'chute) is useless?

I have newspaper clippings, by the hundreds, referring to accidents of airplanes crashing from high altitudes and far away from their destinations. When a plane is in distress, naturally, the pilot loses altitude seeking a proper place for a forced landing. Not finding the proper place he crashes.

Witnesses to one crash, report that the pilot was flying at a low altitude and skimming the tree tops. Obviously, planes reported flying low have been in distress at higher altitudes because, while pilots are far from their destination they are supposed to fly in high altitudes.

Submitting my device to some airplane manufacturers, their engineers, after studying it, agreed that it is the most practical theory along that line and that it will do all the things I claim. But, the officials of the companies expressed doubts that the airplane needs any additional safety, as it is safe enough now. They further say it will not pay them to sacrifice the pay load of the plane and add the additional expense to adopt this safety device.

One manufacturer stated that he was afraid to attempt anything in this line, fearing public's opinion and that the public may think his airplanes are not made well and safe enough if he equipped them with this safety device.

This is a very poor argument. The largest ocean-liners of today, as safe as they are considered to be, have their upper decks lined with life-boats and life-belts. Our modern schools and sky-scrapers are supposed to be absolutely fireproof, but the law says that sprinklers and fire-escapes shall be installed also.

The plane is now hanging horizontally in its normal position, hanging from the 'chute at the center of gravity. The action throughout has been gently progressive without sudden shocks or entanglements.

Precautions are taken everywhere to protect human lives. Is aviation, the most modern method of travel, going to remain so dangerous without any further precautions in saving their investments and human life?

It is agreed, among most authorities, that any arrangement that depends upon the voluntary action of the passengers is doomed to failure because the passengers, being in a state of panic, cannot be prevailed upon to jump even under the utmost pressure. Therefore, providing the passengers with seat-packs or projecting windlasses is simply a waste of money and time.

More logical is the recent attempt at dropping the passengers out through the floor with a movement of a lever in the pilot's compartment, but such arrangement will not afford the protection to the passengers that is provided with my appliance. From ten to fifty passengers, discharged in a group and floating aimlessly about, will sooner meet with disaster, particularly with a high wind blowing as is usually the case in an airplane accident.

Several years ago, in France, a separate passenger cabin was devised which could be released from the main plane structure and lowered by a parachute. While this afforded protection to the passengers who remained in the cabin during the time that they were being lowered by the parachute, yet the plane was not saved and, by gliding without control, the plane could cause a considerable amount of damage in the vicinity of a city or settled district.

Therefore, any appliance that does not lower the plane as a whole, together with the passengers, is only doing a small part of the job. It does not prevent an enormous monetary loss nor does it protect property and lives upon the ground.

The U. S. Army Air Corps' Contribution to Aeronautics

by ALICE R. D. GILLIM and MINERVA A. SNODDY

Our readers have long awaited the publication of an authentic article on the many important contributions made by the U. S. Army Air Corps to the development of aviation and aeronautics in general. We wish to thank the authors, and Alice R. D. Gillim in particular who is a cataloguer in the library of the U. S. Army Air Corps

MANY years previous to the time that the Aviation section of the Signal Corps took up aeronautics, the seed of aerial transportation and aerial warfare had been sown by the Montgolfier brothers in the little town of Annonay, France.

As a result of their "insatiable curiosity" in seeking to find out if their paper bags, for they were paper bag manufacturers, would rise if filled with heated air, they became the inventors of the balloon.

Between that period and the time our Army started playing its part in aeronautics, many people had contributed their efforts to the progress of this new science. Some of these were mere day dreams, some ludicrous, others theories, while a number were real aerodynamical studies.

But it remained for the U. S. Army to bring about the first important growth in aeronautics, when they issued specifications and bids for the first military airplane, December 23, 1907. The result was; the delivery of a machine in 1908 by the Wright Brothers.

From this time on the Air Corps, or the Aviation Section of the Signal Corps, as they were a part of that branch of the army in the early days, made many major contributions to the development of aeronautics.

They have made an indelible impression on most every phase of this modern means of transportation; on industry, technical development, safety measures, postal service, photography, airways and navigation.

After the signing of the Armistice in 1918, the Army flyers could have folded their arms and said, "Our work is done, we have helped to win the war." They did not say this, however, but continued working for greater advancement.

They, as no one else, realized that the airplane had come to stay; that it was an answer to the demand of man for speed and still greater speed in communication and in warfare. They also realized that aeronautical industry must be preserved and that they were the best qualified, at that time, to do the task.

The Air Corps, knowing that unless the aircraft factories received a reasonable number of orders that they could not remain open, made every effort in their power to keep going a steady flow of orders for airplanes and engines. This helped to prevent a sad waste of highly specialized personnel and expensive machinery.

The early pathfinding flights through uncharted skies, made by the Army personnel, were an inspiration to many a youth and made him resolve that he too would fly some day. In such a manner, the United States became air-minded and demands for the development of our airlines were brought about. It is interesting at this time to note some of these "Pathfinding" flights as many of them were called.

The "Round the Rim Flight," commanded by Lieutenant Colonel R. S. Hartz, took off from Bolling Field, Anacostia, D. C., July 25, 1919, in a Martin Bomber. After a flight of approximately 9,823 miles these explorers of the sky made the following recommendations: first, that all pilots flying cross country be required to place on the map certain symbols which will indicate the location of country fields and that this map be turned into a central office where these marks could be transferred to permanent record maps. This

Official Photo U. S. Army Air Corps.

The "Round-the-World-Flyers" of the U. S. Army Air Corps who, in 1924, circumnavigated the globe, flying a distance of approximately 9,823 miles and across the Atlantic Ocean. This was three years before Lindbergh made his flight.

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would make it possible to furnish pilots with accurate data. Second, that in the future every Air Corps pilot be given a thorough course in engineering; and third, that the Air Corps make arrangements with the railroads so that the dispatchers thereof will give the necessary data to cross country flyers, covering the division over which said pilot is about to fly.

They found that this method, over the Rocky Mountains for determining weather conditions, smoke, etc., was most satisfactory. They also found that country fields might become suitable landing places.

The Alaskan Expedition in 1920, commanded by Captain St. Clair Street, also made its contribution to aviation. The 9,000 miles from New York to Nome, Alaska and return, in four DH-4 airplanes running their original motors, ended successfully, proving that the plane was a dependable means of transportation.

The "Dawn to Dusk" flight in 1924, made by Captain Russell L. Maughan, in which he crossed the continent in a Curtiss pursuit plane in a day's time, showed the possibilities of the pursuit type airplane, and air-minded people readily saw the advantages to business in such speed.

The greatest saga of the sky happened in 1924 when six Army Aviators, led by Captain Lowell H. Smith, circumnavigated the globe, thereby demonstrating the feasibility of establishing airways around the world, a thing that in time aeronautical industry was to profit by. Today we have not only commercial navigation over the Atlantic, but just recently airlines have been established over the Pacific.

It is mostly along the technical line that the Air Corps personnel has done so much for aernautics. They have not only been fully responsible for the development of much equipment, but have cooperated with aircraft factories in the development of many new devices.

Official Photo, U. S. Army Air Corps.

Captain Albert W. Stevens, with the long distance K-6 camera. He is noted for research work and developments in photography as well as for his supervision of the recent record breaking stratospheric flight.

Official Photo, U. S. Army Air Corps.

The ascent of the "Explorer II," the world's record altitude breaker, starting on its stratospheric voyage. This was the joint experiment of the U. S. Army Air Corps and the National Geographic Society.

The electrically heated suit that is so essential to altitude flying has been one of the things that the Material Division has worked on to a successful end. Aviators are now able to fly to extreme heights protected from the cold.

Another essential piece of equipment necessary to altitude flying, owing much of its success to the Air Corps personnel in the army laboratories, is the oxygen apparatus. Little in the present trend toward altitude flying could be accomplished without it, for man requires the use of oxygen when he reaches an altitude of about 18,000 ft.

Other aeronautical developments that the Air Corps has had a part in, or the whole responsibility of developing, are the variable pitch propeller, cooling systems for engines, injection systems, retractable landing-gear, oleo landing-gear, streamline wheels, engine cowling, monoplane structure, better grade of fuel, metal monocoque structure and crash-proof tanks, all of which have made for better construction and design in aircraft.

These aeronautical developments not only have made for better and speedier planes, but have made the airplane a safer vehicle, thus giving the public more confidence in aeronautics as a means of travel.

Before leaving the subject of safety measures that the Army Air Corps has been responsible for, special stress must be given the parachute, and special credit must be given to the man that has spent years in perfecting it. That man is Lieutenant Colonel Edward L. Hoffman, Air Corps, who is stationed at Maxwell Field, Alabama.

In recognition of his intensive work on the parachute, he was awarded the Collier Trophy in 1926. This trophy was donated by Robert J. Collier, and is awarded annual by the National Aeronautic Association for the greatest achievement in aviation in America, the value of which has been thoroughly demonstrated by actual use during the preceding year.

The U. S. Air Mail was inaugurated on May 15, 1918, between Washington, D. C., Philadelphia, Pa., and New York City, by the War Department in conjunction with the Post Office Department.

The Army Air Corps had charge of the control and operation of the service and furnished planes, pilots, mechanics, and spare parts. This was one of the greatest demonstrations in the world of the practical commercial utility of the airplane. It was the first aeronautical enterprise to show that it is possible to maintain a dependable schedule and fly in all kinds of weather. The use of the service has been proven by its extensive growth.

As early as 1861, the possibility of using aerial photography in military operations was recognized by the Balloon Corps of the United States Army. However there is no authentic record of such photographs being taken. Wilbur Wright states that his brother Orville Wright took a motion picture from an airplane at Centocelli, Italy, April 24, 1909. This, he said, was the first photograph taken from an airplane of which he had knowledge.

(*Concluded on page* 214)

Official Photo, U. S. Army Air Corps.

Major E. L. Hoffman, an Army Air Corps Officer who has accomplished much in the development of the parachute. He is an outstanding figure in aeronautics.

You Can't All Be Pilots

by HARRY A. WHITE

A heart-to-heart chat with young men eager to enter the aviation industry. The author calls attention to the fact that there are other occupations open besides that of pilot, just as desirable and just as remunerative.

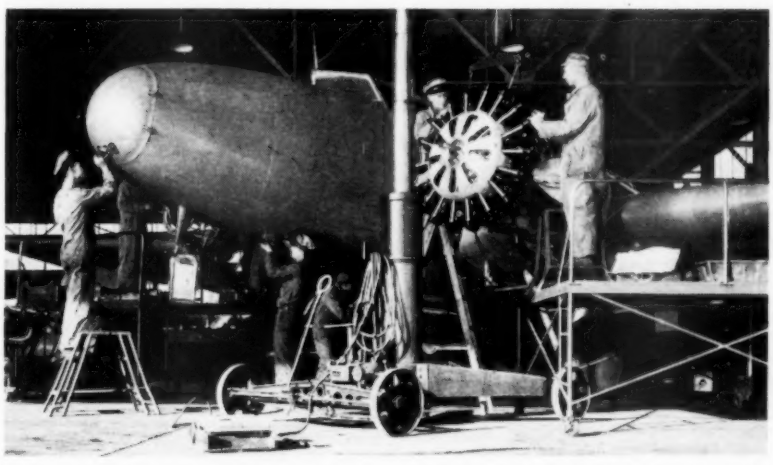
EVERY healthy red-blooded man or boy takes a deep interest and gets a real thrill out of aviation. Flying, looked at as a profession, suggests the element of daring, adventure and travel that appeals to every virile male citizen.

But—unfortunately—not all of these enthusiasts can hope to become pilots on commercial airlines. There are many live opportunities in aviation—oodles of them—but the majority of these opportunities are in other branches of the aviation industry, jobs on the ground that keep the ships in the air. And so, airfans, look over the long list of possibilities in aviation that are just as promising and more secure than just piloting a ship through the air.

But still, you say, this does not satisfy the yearning for adventure and thrills that first caught your interest. You like aviation, largely, because you wish to perform heroic deeds with a spice of danger in them, and are not content to keep one or both feet on the ground. You feel that you are particularly qualified, above all other men, to sit at the controls of a speeding leviathan of the air and will not rest until you accomplish this desire.

But I differ with you and your opinion. I am certain, that once you come into contact with the many fascinating, remunerative and really interesting features that the ground jobs offer, you will lose the edge of your zest for actual flying. Please tell me where there is a greater thrill on earth than to watch a ship of your own design and construction, take to the air on its first flight and then to have the test pilot slap you on the back and say, "Boy, she's all airplane, I'm telling you! Some ship, what I mean."

There is no thrill like that felt by the engineer and designer of a new plane when the child of his dream first takes to the air. To the creative mind, this is the apex of joy and the high spot in his life that can never be equalled by any thrill experienced by a pilot.



Airplane mechanics engaged in an overhaul on a Boeing "247-D" belonging to United Air Lines. This calls for skilled men working under a government license.

And there is no satisfaction in piloting that can equal that of a mechanic who sees his handiwork performing successfully. The engineer and mechanic are not spectacular persons, it is true, but they have real solid worth and are really engaged in the most interesting part of the game, taken from every angle.

Upon the aeronautical engineer rests the responsibility for the design of the plane, the selection of the materials entering into the plane and the supervision of its construction. He makes his plans so that the ship performs in accordance with previously outlined requirements and so that the cost does not exceed a certain figure. This is the "designing engineer" in whom the greatest interest attaches.

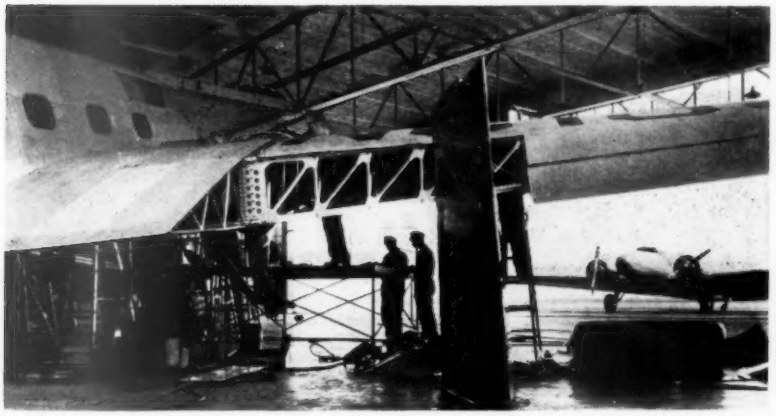
But, in the large airplane manufacturing plants, there are other engineers. Production engineers, engineers of processing, industrial engineers and engineers in many other branches that attend to the manufacturing end of the business. Then, there are the aeronautical draftsmen who work under the supervision of the engineers in making the detailed working plans and drawings. The position of aeronautical draftsman, a very interesting job, usually leads to advancement of aeronautical engineer, because the draftsman is really an engineering apprentice.

But, of course, the positions of engineer and draftsman require a high degree of specialized training. With few exceptions, the engineer is a college trained man with an engineering degree (not always), or a degree from an accredited aeronautical engineering school. With his education, he must combine good personal judgment, a strong sense of responsibility and a great imagination and powers of visualization.

The draftsman must, of course, understand the principles of drafting as applied to airplane structures and, preferably, should have a fair knowledge of such elementary and basic sciences as physics, mechanics and shop processing.

In the smaller plants, the engineer sometimes combines a number of functions within himself. He designs, makes his own drawings and supervises the work in the shop. It is here that he gets an all 'round experience that will prove of value to him in later years.

The airplane mechanic holds one of



Then, if you don't like heavy work around the plane or engine, there is always a good opportunity in the instrument repair department—a glorified watchmaker's job.

the most highly specialized jobs in the crafts and trades whether he is a construction mechanic in a manufacturing plant or a repair and service man in the field. The mechanics, according to the regulations of the Bureau of Air Commerce, are divided into two groups: (1) Airplane mechanics, (2) Engine mechanics, but a man can hold licenses in both branches if he has the necessary experience and can pass the necessary theoretical examination.

Yes, an airplane or engine mechanic must hold a government license just as a pilot must hold a government pilot's license. The Bureau of Air Commerce is taking no chances with incompetent service or repair men who it regards, very properly, of equal importance to the pilot. As a matter of fact, it requires a longer time to get a mechanic's license than a pilot's license because the mechanic must have had at least two years' practical experience in a shop before he applies for a license, while a transport pilot only requires 200 hours of solo time.

Excellent physical condition and sound health are the basic fundamental requirements for a pilot's license and failure to pass the physical examinations have "flunked" many a prospective pilot. Before he can take out a student's permit for learning to fly, the applicant must take a rigorous physical examination by a physician appointed by the Bureau of Air Commerce.

And then, even after he has received his transport pilot's license and has been flying a job, the pilot must continue to take physical examinations frequently with a chance of disqualification at any time in his career. And it does not take much of an ailment to accomplish this disqualification.

But, fortunately, the airplane and engine mechanic are not regulated by any stringent physical requirements. Just so long as he is strong enough and active enough to satisfy his employer, he is satisfactory to the Bureau inspectors. This is one of the great advantages that the mechanic enjoys compared to the pilot.

If the mechanic must go to work ever morning in a wheel-chair with a traine nurse in attendance, it is no affair of the Bureau of Air Commerce so long as he can use his head and pass the written examinations. Writer's cramp is the only disability that will bar out a mechanic, so far as the government is concerned.

The Bureau requirements for good morals and good character are quite broad and difficult to define. While it is quite likely that the Bureau would not issue a license to Dillinger or Jesse James, yet any further measurements within this range are rather hazy, both in theory and practice. This is largely a matter of common sense and judgment rather than precise measurement.

Be it said, however, that the employers of pilots and mechanics are quite fussy on the subject of morals, conduct and character, whether the applicant be a pilot or mechanic. Aviation is just one of those industries where hard drinkers, loafers, hangers-on and hoodlums are not wanted. And this automatically clears up the situation from a moral standpoint. These aviation jobs take all the brains and stamina that are in a man, and his mind cannot be clouded or befogged by any pernicious practice.

But, there are other men working on the ground beside the mechanic, men with mighty interesting and well paid jobs. Every large airplane or airport employs radio operators, meteorologists, radio electricians, traffic men, airport managers, field service workers and many other specialized men. Aviation radio is one of the fastest developing branches of aviation and offers excellent opportunities. Then there is a legion of inspectors of various classes and types to say nothing of the numerous executive positions.

Yes. Statistics show us that there are five men on the ground for every pilot flying in the air and men who are every bit as important as the pilot. Aside from the airplane and engine mechanics, just described, there are still other mechanics and workers, including sheet-metal workers, instrument repair men, parachute packers (licensed), propeller repair men and electricians. So—why turn down an opportunity for a ground

(*Continued on page 216*)

Instrument repairmen have a pleasant and interesting occupation that is open to those having physical limitations.

Invents a New Weather Indicator

A. F. Spilhaus and his invention, an indicating meteorological psychrometer for indicating wing-icing conditions.

A NEW type hygrometer or psychrometer, particularly designed for meteorological determinations, has been designed by Athelstan F. Spilhaus, research assistant, Massachusetts Institute of Technology.

Its purpose is to identify the type of air-mass overlying a region and it is therefore expected to be useful to pilots by warning them of the peculiar condition that causes ice to form on the airplane wings. It is not, in the usual sense, a weather predictor but simply an instrument for indicating air conditions as they exist.

They Dump 'Em in Russia

ESCAPE ports in the cabins of sixteen gigantic airplanes being built in Moscow, Russia, will clear the ships quickly in case of mishap. Each passenger will be provided with a parachute. The ships, designed like the Maxim Gorky, which crashed with a loss of forty-nine lives last May, will have accommodations for sixty-two passengers.

Hostess Specifications

AN air transport hostess must be attractive. She must be young. She must be slender. She must be able to turn down proposals without offending—and she must think only of her career.

Miss Lena Kraft, chief stewardess for Hanford Airlines, thinks it would be much easier for a young woman to qualify for the movies than for a job as stewardess on an airliner. The air stewardess must watch her pounds just as closely as Joan Crawford. She can't weigh over 118. On the ships of Transcontinental and Western, none are over five feet four inches. None are older than 26 years. All are registered nurses.

Twenty Hours Under the Hood

by GEORGE I. MYERS

One of America's best known flight instructors tells a highly interesting story of blind-flight instruction methods whereby the student is taught to fly by instruments alone, covered by a hood so that it is impossible for him to guide himself visually.

SUPPOSE I had just handed you a slip of paper on which you read these instructions:

"Hold takeoff course to 1,000 feet.

"Spiral left to 2,000.

"Spiral right to 3,000, level and cruise at 1,750 r.p.m.

"At 3,000, I'll put you on a 120-degree course and tell you when you're over the field.

"You take the ship again, hold 120-degree course 8 minutes, hold north eight minutes, then hold 285 degrees 15 minutes."

I tell you that we will have a NNW wind of 34 miles an hour at 3,000.

Now, let's assume that I take the ship off. When we reach 200 feet I waggle the controls, and you proceed from that altitude. I haven't told you, but you have had 10 hours' experience in piloting an airplane, and you are flying by instrument, under a dark hood in the forward cockpit of a training plane. Further, you have not yet had a glance at mother earth from an altitude higher than a four-story building. How the ground looks from an airplane, you haven't the slightest idea.

What would you do?

I'll tell you. You would climb with wings level, swing the ship into a two-minute timed turn and spiral upward to the left in a complete circle, then spiral right to complete another circle. And because you have learned something of the meaning of your several flight instruments, you'd come out of the second circle pretty close to 3,000 feet.

More important, after you have held the three assigned courses the required time, you'd know within reasonable limits where you are, although all you see is your instument panel, because in as short a time as 10 hours in the air you have learned to fly by time.

The author, George I. Meyers (left) and Gregg (right), with three British Royal Air Force Officers who recently took a course at Boeing in blind flying.

Of course, you are not a finished pilot, ready to take a plane into the air through fog or ride a radio range beacon to its source or bring a ship down a landing beam. But you are learning the fundamentals of instrument flying which will make you a better and more accurate pilot than older men who fly by feeling and sight alone, and are lost when they no longer have a good view of the earth.

If you could trade places with Henry Belden, Allan Calhoun, Cale Cook, George Laverack, Walter Lehwalt or O. D. Howe you would understand better what I mean when I suggest a "timed flight" under the hood. These boys are members of the first flying class that began training in darkened cockpits and experienced many unusual maneuvers, before being permitted to glance over the side for a sight of the earth.

This is something new in flight training, an innovation brought about by the demands of modern airliner flying. Pilots of the great ships which span continents and oceans no longer fly by guess and by gosh. They navigate their courses, much as a mariner plots the course of an ocean liner.

To a large extent, the modern pilot learns to fly while yet on the ground. Before I carried aloft any of the six students named I gave them several ground lessons, explained the controls and told them how the rudder and stick change the attitude of a plane in three dimensions. Then what?

Flights under the hood proceed through four stages until the student completes approximately 20 hours.

First, he is further familiarized with the controls and finally the instruments. On his first flight, when a safe altitude is reached, he is told through the interphone system to "take her". From my place in the open cockpit of the trainer I can visualize his mental gymnastics as the plane bobs and bounces through the air, now diving, now one wing low, again climbing too steeply for comfort.

Second, having learned during the first few lessons to hold the plane fairly straight, we introduce the student to "timed turns". This is the important step in his flight education for it develops his sense of the necessary control move-

Here are six students, with a total of 120 hours of flying, who have never seen the ground from an airplane, these men having spent all of this time "under the hood." The white lines on the ground are for instruction purposes and demonstrate how the radio beams intersect at the cone of silence at the edge of the field.

ments. Further, upon time depends his success in later instrument flying.

Suppose we take one of our "blind flyers" up for a timed flight. Cale Cook, for instance. We are in the air, flying at 200 feet. I have just turned the controls over to Cook.

Sitting back quietly on my parachute, I observe my instruments. The student is holding a fairly steady compass course, climbing approximately 400 feet a minute. At 1,000 feet, I press the button opening the 'phone circuit, saying:

"Start your left spiral".

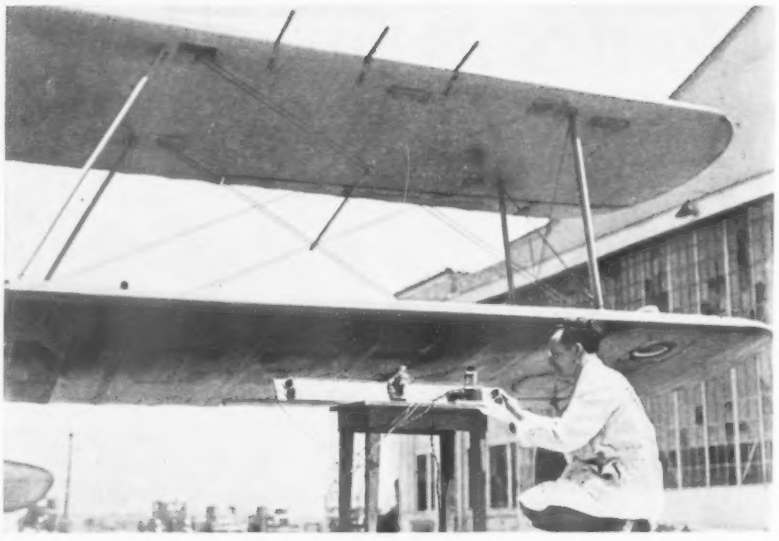
Cook goes into a left turn, coordinating rudder and control stick movements, placing the ship in the timed turn position and holding the same air speed. He holds this two minutes, making a 360-degree turn and coming out on his original course.

There's the secret of an instrument turn. Two minutes with the turn hand held steady at a pre-determined deflection completes a 360-degree turn. Observing his altimeter, he finds he has reached an altitude of 1,800 feet and continues straight flight to 2,000 when he swings the ship right into his time turn and repeats the performance. Pulling out of the turn at 2,800, he again climbs along his original compass course to 3,000 feet.

From here on, following repeated practice flights, the student is able to hit an assigned course within five degrees. If a definite position of his turn hand produces a 360-degree turn in 120 seconds, how long need he turn to achieve a 90-degree turn? Thirty seconds obviously is the answer. Thus the student need only consult his clock to achieve any desired turn.

That's the second phase of flight training under the hood. Now we are ready to "fly the beam". Mystifying as this seems to the non-pilot, riding a beam is not difficult for the well-trained instrument flyer.

The other day I gave one of the students a beam flight. He was able to picture the situation while yet on the ground, for on the apron near the runway on the Oakland, California, airport, is painted an outline of the field. Also painted on the concrete are two white lines representing the radio beams which intersect at the radio range station's "cone of silence" over the station antennae.



After a flight. The students check the radio landing-beam receiver to make sure that it is functioning properly.

The cone is located near the northwest corner of the field. Each line gradually widens from the cone, and is known by name. Therefore, if later I tell a student he is flying out the Concord beam, he knows exactly where he is headed.

After several training flights, during which the student learns to identify, get on and follow radio beams, he becomes quite proficient in following the three-phase problem to a successful conclusion.

Now, let's make the problem more complex. Let's have a student locate a beam and put his ship in position for an instrument landing. How do we proceed?

With a student under the hood, I taxi the plane across the field and turn it into the wind. There I give him the controls. He takes off, climbs in straight flight to 1,000 feet, makes timed turns right and left to 3,000, then levels off on the same heading along which he had taken off.

Now I give him several problems, such as flying several compass headings, in a deliberate effort to lose him. When convinced he is well lost, I turn on the radio and tell him to locate a beam, identify it, locate the cone of silence, and from that point locate the airport and approach for a landing.

Suppose, for instance, he finds himself in an "N" sector. He places the ship on a 50-degree course, flies that course until he intersects the beam, makes a 90-degree right turn to a course of 140 degrees. This identifies the Concord beam for him. Now he makes a left turn of one minute, 40 seconds, to a course of 200 degrees, which is the Concord beam course leading toward the radio station near the corner of the field. From this point he follows the beam to the cone of silence.

At the cone he makes a right turn into the San Francisco beam and follows it out four minutes, turns out and back into the beam to locate the cone again. Having made the turn, knowing he now is some five minutes flight from the cone of silence, he partially closes the throttle and begins to lose altitude at 500 feet a minute. When he descends to the 1,000-foot altitude, he levels off and flies into the cone of silence.

Remembering the picture on the ground and the relation of the airport to the cone, as well as his instructions, he now changes from an 80-degree magnetic course to a course of 100 degrees, magnetic. He holds his alttitude of 1,000 feet for 75 seconds to the dot, makes a right turn of approximately one minute to 270 degrees, losing 500 feet during the turn. Holding the new course, he closes the throttle and comes in for a landing.

This is not trick stuff, used to train stunt flyers. We are preparing young men to pilot large ships across continents and oceans in safety and with an accuracy unknown in the past.

To digress a moment, suppose we liken

(*Concluded on page 221*)

Students studying the lift characteristics of a wing-section, in the mouth of a wind-tunnel, before their flying practice, at the Boeing School of Aeronautics.

Suicide Bombing is the Bunk

by T-2003

Our expert on military aviation tells what he knows and thinks of the "Dive of Death" thriller sent out by the Italian publicity bureaus. The boys may be patriots but they are wasting their lives according to the author.

THE plane is quickly sighted by one of the anti-aircraft lookouts on the battleship. It looks like an enemy bomber. "Alerte" is sounded.

Closer the plane comes, then the nose dips and there is no longer any question of its target. A battery of anti-aircraft guns opens fire. Several machine gunners train their pieces ready to fire when or if the plane comes within range.

Above the noise of the guns there is heard wisps of a thin screaming note as the plane picks up speed. Miraculously it avoids the gunfire of the battleship. Closer it comes; screaming, diving, tail up and nose down, rocked by the shell-blasts, peppered by the .50 caliber ball and tracers from the small guns, it deviates not a foot from its desperate course. Down, down—

The pilot's close-pressed lips relax, he murmurs a blessing,—but not on his foe. He is consecrated to his task, sanctified by his mission,—but a doomed man.

Down, down, all the machine guns chattering from the deck and tops do not stop him. Then a crash, a blinding roar, and pilot and machine disappear. The battleship rocks. In a few minutes it begins listing, further and further, until with a sudden roll it goes keel up and slides to Davy Jones' locker.

"It is well known", say recent newspaper reports, "that a group of patriotic young flyers have sworn to sacrifice themselves and their planes in a bomb-laden dive into the battleships of their country's foes, should war be declared. One plane and a pilot in exchange for one battleship is considered a profitable swap of destruction."

But the Army Air Corps bombers I interviewed laughed politely and said it was great stuff,—for the pulpwood air-fiction magazines but not for practical-minded air fans. The Navy flyers, although dive-bombers themselves, were equally cynical.

Photo by U. S. Army Air Corps.

Here's one of the big bombs used by the U. S. Army Air Corps with one of the bombers in the background.

What had seemed a foolproof idea wasn't such a sound one after I listened to the ideas of really experienced military and naval airmen; all of whom knew almost as much of anti-aircraft artillery technique as they did of their flying game.

"Did you ever hold a plane in a power dive pointed down at some ground object?" I was asked.

"Of course. But why the question?"

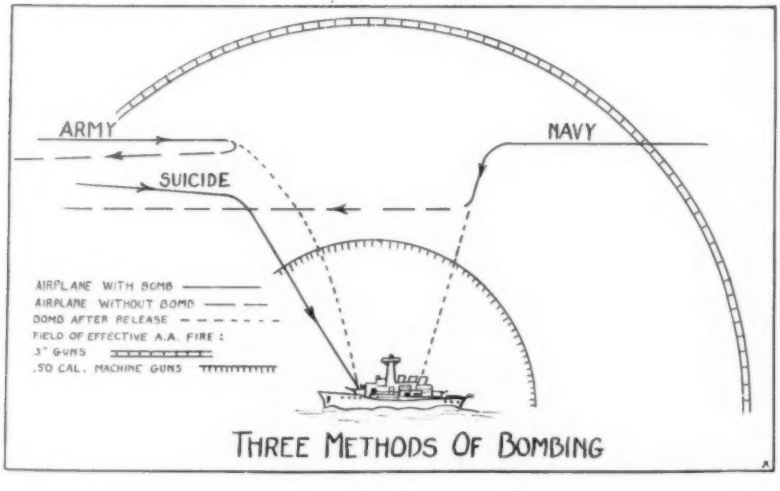
"Ever realize what a fine target you would have made for an anti-aircraft gun. No deflection. A quickly changing range of course, but the m.g.'s would have picked you up at 2,000,— not feet but yards. And another thing; —" and the Navy bird launched into some more technical data tending to discredit the so-called "suicide bombing."

It seems that the long range anti-aircraft guns, the 3-inch affairs, and the U. S. Navy uses some even larger than that, have two main sources of error in bringing fire on an airplane. One is deflection; that is, the amount they should "lead" the ship as the sporting gunner leads a fast flying duck with his shotgun.

The other error is in computing the range or distance of the plane, as the shells hurled aloft are fuzed to explode at a certain time of flight, or distance from the gun's muzzle, thereby tearing the plane to pieces either by explosive force or the flying steel fragments; or else exploding too soon, too late or too far in front or behind the airplane. An airplane diving straight at a gun battery automatically removes or materially lessens one such source of error, —that of deflection.

With a zero deflection, the problem of fuze-setting is still relatively important; but the shells have a good chance of striking the airplane even though they had not yet exploded due to the rapidly decreasing range of the airplane. At 6,000 feet altitude the diving airplane would come into range of the .50 calibre machine guns, which would open up and shoot what might be termed a stream of bullets at the approaching target. Their *effective* range is 4,000 feet.

These machine gun bullets are not fuzed to explode, although experiments are continuous along those lines, but



THREE METHODS OF BOMBING

rely on a direct hit, preferably on a vital part of the plane or on the pilot. Their major remaining source of error is that of deflection, except on nearly vertically approaching targets. So here comes the most obliging young man in the world, bent on destroying himself for his country, or emperor or dictator or something, diving his plane and its bomb headlong into the enemy battleship. Only he dives all three,—his plane, himself, and the bomb, smack into a stream, or several such, of .50 calibre bullets.

"Here's what they look like" my Navy friend said, and handed me a specimen. "D'ya think a pilot, however heroic, could maintain a heavily laden plane in a power dive for several thousand feet after being struck by one of these bullets which has a terrific smashing effect on anything it strikes?

"Or, imagine one of them smashing into the fuze of the bomb, provided the pilot had already switched the fuze from the SAFE to the ARMED position.

"In such a case the pilot and all would be blown to smithereens, perhaps while still a mile away from the battleship. And, if the pilot waited too long to arm the bomb it would be a difficult thing for him to do were he wounded during his long dive to destruction; wounded not too badly but enough to necessitate using all his waning mental and physical resources on the piloting of the airplane alone."

Reviewing the description of the suicide dive it appears that the stock phrase "miraculously it avoids the gunfire, etc." is only too true. It would be a miracle indeed were the battleship's gunners on the alert.

All this seems like an indictment of the navy method which is also that of dive bombing. The Navy's trick, however, is to come in at about 10,000 feet altitude, go quickly into a vertical dive and release the bomb. The pilot stays in the dive only so long as it takes him to steady out the plane in the dive and aim for his target. That is all the dive he needs.

The bomb is released, and there is a gadget that holds the bomb off the landing gear and propeller as plane and bomb part company; then the pilot comes out of his dive and scoots away. By this method, just as great accuracy is obtained, it is claimed, as by any suicide dive. The airplane presents the ideal target to the anti-aircraft artillery for only a brief moment. The tactics of naval air torpedo fire are somewhat similar; translated from a vertical to a horizontal plane.

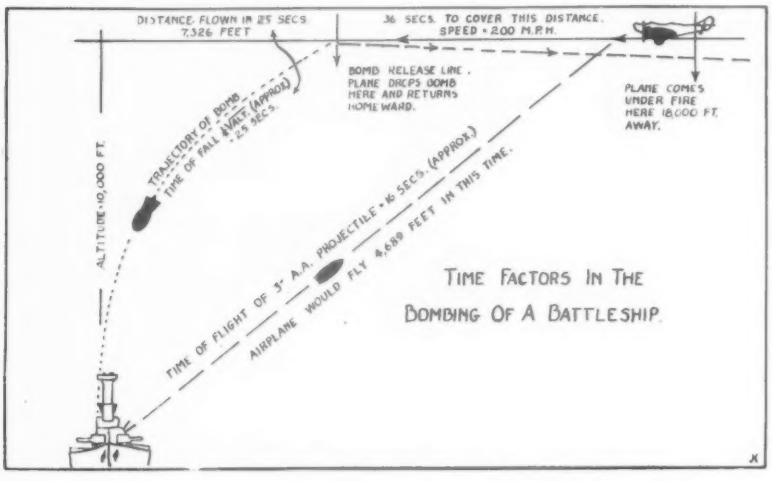
Then there is the matter of missing the battleship itself. A large bomb exploding about 20 feet below the surface of the water but near the ship's hull will do more lasting damage than if it had struck the deck or a part of the superstructure. This has been proven by official tests. That is why bombs so employed have delay fuzes; that they may plunge to the desired depth before exploding after impact with the surface, or even tear through the deck to explode between-decks.

A bomb with an airplane fastened to it would probably be so delayed by the airplane should they strike the ship's control mast or the sea as to cause the bomb to explode above the decks or too close to the water's surface.

The well known photograph of a phosporus bomb striking the crows nest of a battleship is an instance of a bomb striking the superstructure and exploding many feet above the deck doing no critical damage to the ship itself. In this case the bomb was dropped from a low altitude and had little velocity when it struck.

Compare the penetrating power of a bomb, with a diving airplane attached at the time of contact, with that of a free falling bomb; the former with a probable speed of 325 miles an hour and the latter well over 500 miles an hour when dropped from 10,000 feet altitude. A bomb must tear itself through such minor obstructions as rigging, signal masts and even decks to wreak the most damage when it explodes. Fuzes with too long a delay will allow the bomb casing to disintegrate through the shock of striking before exploding the charge.

(*Concluded on page 220*)



Aviation Products Co. Elects New President

Major Woeltjen in flying togs.

AVIATION PRODUCTS CO., a well known aircraft supply house located at 619 S. Federal St., Chicago, have announced the election of Major H. H. Woeltjen as its new president. Aviation Products Co. have featured quality products at attractive prices. Their line includes all sorts of aviation supplies, equipment and gadgets.

As a result of popular demand, Aviation Products Co. have added to their line a department for the sale, purchase and exchange of used airplanes. Major Woeltjen, newly elected president, has taken personal charge of this department.

"The Used Plane Division of Aviation Products Co.," according to Major Woeltjen, "is destined to become the popular used plane mart and exchange of the country. We intend to list and offer for sale only those planes on which accurate and full information is available. The owners of all planes we list are required to reveal complete data regarding their airplane and we will be in a position to answer inquiries at a minute's notice regarding any important detail of the planes we list.

"The aviation industry has been long in need of a reliable, one-price used plane exchange and we intend to make this new division an important part of our business. As far as we know, there is no national organization such as ours equipped to handle a used plane exchange such as we are offering and we are certain that our new service will win an enthusiastic response on the part of the American air-minded public."

Major Woeltjen, or "The Major" as he is generally called to distinguish him from the eight or ten majors at the Municipal Airport, was born in Chicago in 1891. He is a graduate of Lane Tech, Webster College of Law and the S.M.A. at the University of Texas, and

(*Concluded on page 206*)

High-Lights and Side-Lights

by M. A. RODDY

Interesting notes concerning the aviation industry and aviation personnel taken here, there and elsewhere by our flitting reporter on his rounds of the airports.

JAMES MEAD, chairman of the House Post Office and Post Roads Committee, believes that very shortly there will be a five-cent airmail postage which will end airmal subsidies, explaining that already over 60 percent of airmail aviation is out of the subsidy class and is earning money.

Commercial airlines grossed $8,505,863.98 for the last full quarter with a net profit of $255,005.

* * *

IT is expected that Congress will adopt a safety code for the air which will be based upon answers to questionnaires which have been sent to airplane firms, aeronautic societies, pilots' associations and government officials. According to Congressman Mead, the legislation will provide minimum safety requirements for multimotored planes in passenger service, two-way radio and provision governing hours and mileage flown so pilots will not become fatigued.

* * *

A SUGGESTED motto for Brig. Gen. Oscar Westover, who succeeded Maj. Gen. Benjamin D. Foulois as chief of the Army Air Corps, is the immortal statement of Rear Admiral Robert E. Peary, discoverer of the North Pole, to the Senate Committee on Military Affairs, June 18, 1917: "It should be the fixed national aim of the United States to become the first air power of the world. Why not take the initiative and lead the way?"

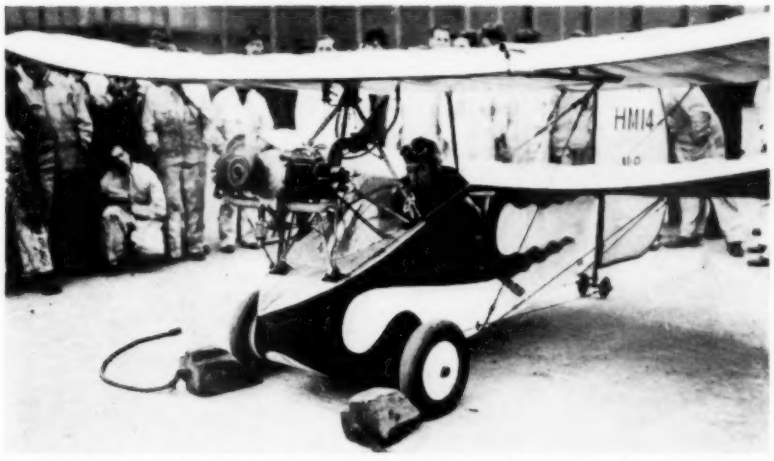
* * *

COL. CHARLES A. LINDBERGH, accompanied by his wife and young son, Jon, left the United States on what was heralded in the press as a secret move in order to thwart a kidnapping plot.

However, intimate friends of the Lone Eagle declared that the Colonel had been planning to leave the States for over a year and that it is believed that he will be associated with Imperial Airways in the inauguration of trans-Atlantic air service.

It is no secret, in aviation circles, that the jealousies of foreign nations have prevented the United States from initiating this service to date and, were it not for diplomatic red tape, Pan American clippers, conquerors of the Pacific, would also be flying over the Atlantic.

British and French aviation interests have refused to permit America to establish landing bases over the Bermuda-Azores route. The State Department plans a series of conferences in order to remove present obstacles so that trans-Atlantic service may be open by the summer of 1937.



Well, well, if here isn't Clyde Pangborn, the ace of aces, trying, with considerable difficulty, to get a Flying Flea (Louse) off the ground. Those chocks are sure big enough to keep her from roaming.

* * *

PILOTED by Flight Captain Germain Bonnot of trans-Atlantic fame, the thirty-seven ton French seaplane, "Lieutenant-de-Valsseau-Paris," largest in the world, is making an air tour of French colonies following its successful crossing of the South Atlantic.

Harold See, Burke Miller, and L. Harmantos, have the distinction of being the first three passengers to make a commercial trans-Pacific flight aboard the Philippine Clipper.

* * *

AFTER two attempts, Clyde Pangborn flew the "Sky Flea" which had been shipped to this country from England by Sidney Arram who was present at the tests made at Roosevelt Field, Long Island.

* * *

WHILE enroute to the air races, Miss Annette Gipson made a forced landing in a field near Commerce, Ga., only to be greeted by an irate farmer with an axe in his hand and a displeased expression that suddenly changed to one of welcome and delight for the ladybird was his daughter.

* * *

GEORGE C. F. DALZIEL has the distinction of being the first subarctic trapper to use a plane and on his last hunting expedition he "winged" pelts valued at four to five thousand dollars.

THE long and short of the air trip between Chicago and Washington is Pilot Bledsoe "Slim" Payne, tallest flyer on the American Airlines, who is 6 feet 4, and Elva Waltemire, stewardess, shortest of the country's 200 airhostesses, measuring 4 feet 10 inches.

* * *

CAPTAINS Albert W. Stevens and Orvil A. Anderson were decorated by General John J. Pershing with the Hubbard gold medal of the National Geographic Society for their record-breaking stratosphere flight.

Following the award, the balloonists showed movies that had been taken while aloft which depicted the horizon 300 miles away, showing clearly the curvature of the earth. Oh, Mr. Voliva!

* * *

I WONDER if you have heard the story told by Dr. Henry Greist, medical missionary at Barrow, Alaska, concerning Claire Oakpeha, the Eskimo who ran across the frozen wastes with the news of Wiley Post's and Will Roger's fatal crash? It seems that the Eskimo received $87 from eastern donors which he promptly invested in "grub" and announced "open house to feed all comers."

It required but three days to eat the food and now the Eskimo is broke and his family is hungry again. According to the doctor, Oakpeha would repeat as Eskimos are like generous children with a bag of candy.

* * *

IF it keeps up, no doubt Mr. Vidal will be requiring pilots to take a course in Duck Ducking as a result of injuries

sustained when the feathered flyers crashed into planes while in flight.

Wild ducks flew in the face of Pilot N. S. Small and Aircraftsman A. P. Whalen, of the Royal Canadian Air Force, causing the wreck of the flying boat and severe injuries to Small. Coming out of a vertical bank 2,500 feet in the air, Pilot Finnigan of Oakland, Calif., dived into a flock of ducks, breaking two ribs in the plane's wings, bending the propeller, and denting the motor cowling.

Enroute to Cleveland, Pilot Marion Sterling came face to face with a duck and for a few days after he looked something like a football player who lost his interference while trying to hit the Notre Dame line.

* * *

CAPTAIN DAVID L. BEHNCKE, president of the Air Line Pilots' Association, has recommended that Pilots Lee Bishop and George Farnham of the Braniff Airways be awarded the Air Mail Medal of Honor for skill and courage displayed in safely landing their passengers and plane which was in flames after a motor dropped off in the air near Childress, Tex.

* * *

DICK MERRILL, an Eastern Air Line pilot and William Klenke are returning to the States after delivering a plane at Rio Gallegos to Sir Hubert Wilkins to be used in a search for Lincoln Ellsworth, missing Antarctic air explorer.

* * *

HELEN RICHEY has quit marking time following her resignation as a co-pilot for Central Air Lines and is now employed by Mr. Vidal in marking rooftops. Lady Kingsford-Smith is proceeding with plans which her husband, now lost, was making for a regular air service linking Australia and New Zealand.

Agnes Hurt, who was named the nation's outstanding air hostess, and Pilot Harry Bitterman of the United Air Lines are honeymooning in Western Springs, Ill. Fifteen-year-old Lorraine Dickerhoof made her first solo flight after only six hours instruction at Chanute, Kan., where her father is manager of the local airport.

Mrs. Floyd Bennett, widow of the famous aviator, is working as an assistant to Major Wilfred E. Boughton, New York W.P.A. executive. Jean Batten, following a record crossing of the South Atlantic, now plans a North Atlantic flight.

Stewardess Marguerite Moore of United Air Lines is wearing the silver wings conferring title of America's "Flying Diana" awarded for perfect proportions. Mrs. Keith Miller, noted long-distance air pioneer, is now a London stenographer.

* * *

DETAILS of a round-the-world air race to be held in 1937 are being worked out by the Aero Club of France. All of the itinerary of the race has not been definitely decided al-

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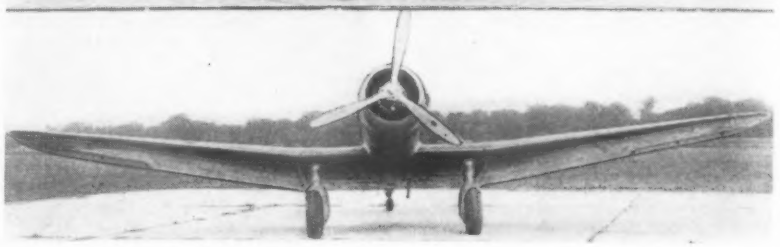
A Big Order for Northrop Attack Planes

by CHARLES J. BAUER



Two views of the Northrop attack plane of which one hundred have been ordered for the U. S. Army Air Corps. This contract amounts to $2,065,074, or an average of $17,958 each.

FEATURING among other developments, a flexibly mounted 0.30 caliber machine gun in the rear cockpit and four others fixed behind plates in the leading edge of the wing, 100 monoplane all-metal attack planes powered with Pratt-Whitney engines have been contracted for with the Northrop Aircraft Corp., Inglewood, Cal., for the air corps.

The planes are being procured through Wright Field, Dayton, following extensive research and testing, including taking off fully loaded 500 feet from a 50-foot obstacle and clearing it.

With spare parts equivalent to fifteen additional planes, the contract amounts to $2,065,074, an average cost of $17,958 each. A year ago the war department ordered 120 of an earlier attack type from the same company, and spare parts equivalent to ten more, for $2,013,600.

The fixed guns are for ground strafing of material and personnel by the pilot. Designed for twenty small bombs or four large ones, and an alternate load of chemicals to be dispensed from tanks, the plane has a gasoline capacity for 1760 miles at 220 miles per hour and a service ceiling of 20,000 feet.

The Rose Parakeet Lightplane In Production

THE Rose Aeroplane and Motor Company, 4327 N. Harlem Ave., Chicago, Ill., is now engaged in turning out the little "Parakeet" biplane that has been shown in POPULAR AVIATION some months ago. This firm has received their A.T.C. from the Bureau of Air Commerce so that the little plant can be licensed and flown in any state.

The "Parakeet" is a single-seat biplane that looks like a real airplane and not like many of the contemporary parasols in the lightplane class. It has an exceptionally strong wing structure that can withstand much rough handling, and is very stable in flight, both of which factors can be easily made an inherent quality of a biplane. On one occasion, for example, an inspector walked roughshod completely across the lower wing without causing damage.

It was the prime purpose of Jack Rose, the old-time pilot who conceived of the plane, to provide flying time for private pilots at a minimum expense and the "Parakeet" has achieved this purpose. It is possible, with this rugged little ship, to make a profit renting it out at $3.00 per hour, thus greatly increasing the number of active pilots in the United States who cannot afford to pay $7.50 to $10.00 per hour for solo time. As it is possible for the majority of pilots, with the "Parakeet" to take at least one hour per week, these men can run up their hours rapidly without the added expense of "check-flights" made necessary when flying only one hour per week.

This little plane has been under development for a period of several years during which time the "bugs" were thoroughly worked out of the design by Jack Rose, himself, who is an experienced pilot of many years' standing. The cost of operation is much lower than would be possible with a 2-place job, both from the standpoint of fuel cost and overhead charges. It is well suited for flying clubs who have many members to solo.

The Startling Toroidal Motor

by JASON L. AYERS

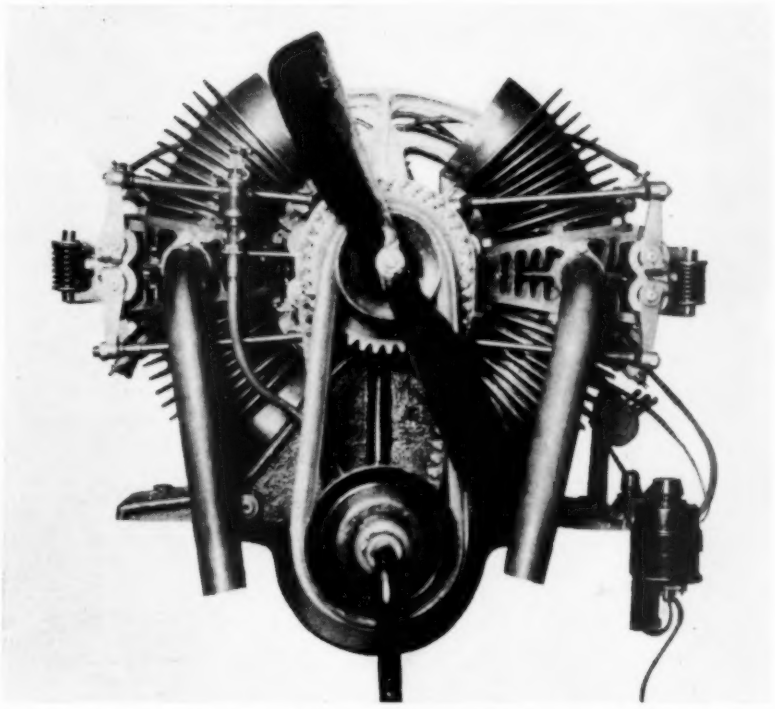
This revolutionary type of engine marks a distinct departure from current practice in aviation engine design. It is an extremely interesting mechanism that has been tested under particularly trying conditions.

ONE of the most radical departures in engine design, during the past year, is the Toroidal aviation engine now under development by the Toroidal Aircraft Motors Co., Municipal Airport, Omaha, Nebr. But, unlike the majority of radical types, this is not simply an inventor's paper idea but it has been built and thoroughly tested.

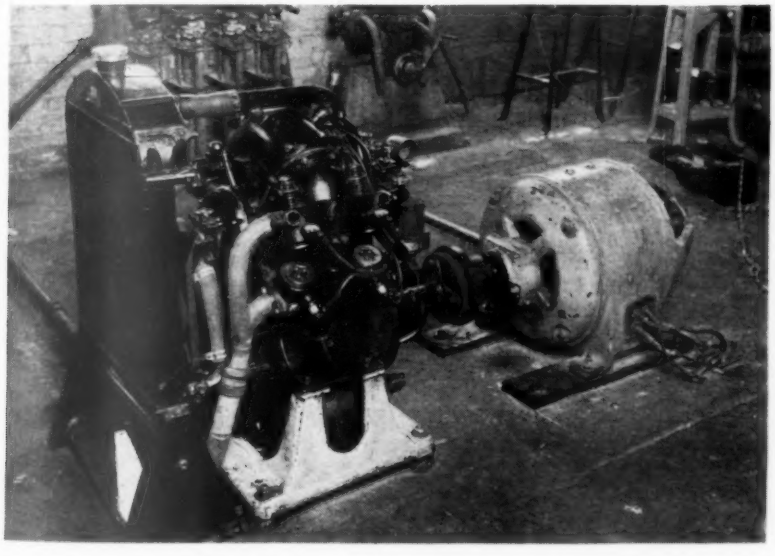
Comprehensive tests on one of the engines were made at the Iowa State Enginering College, Ames, Iowa, under the supervision of the inventor, Louis J. Wolff and Prof. L. T. Brown. These tests showed an unusually low friction loss and an excellent performance.

The water-cooled engine was installed in a Ford car and run under varying conditions for six months and, after 3,500 hours of running, showed no wear after a careful examination. No parts were replaced, no valves were ground and no bearings were tightened. The cylinders remained perfectly round. It is said that the engine took the steepest hills at 5-m.p.h. and would accelerate the car up to 60 m.p.h. in an exceeding short space of time.

A second engine, an air-cooled version of the Toroidal engine, has run for more than 3,000 hours at varying speeds and loads without any appreciable wear. This little engine, which is the equivalent of a four-cylinder engine has 4x4 inch cylinders and develops 56 h.p. at 2,000 r.p.m. Built of grey iron, it weighs approximately 110 pounds.



Front view of the air-cooled Toroidal aircraft engine showing the peculiar cylinders built in the form of a "torus" or ring. The fan and starting crank are installed for convenience in making tests and are not essential features of the engine.



Making a dynamometer test of the Toroidal engine which showed a high mechanical efficiency and excellent performance. The engine is loaded by the electric generator at the right.

This engine is still under test, is not yet in production and will not be until the Toroidal Aircraft Motors Company have assured themselves that it will prove capable under all possible conditions of air service. They, however, are enthusiastic over the results thus far achieved and believe that it will prove the most reliable as well as the lighest engine per horsepower yet designed.

PRINCIPLES OF OPERATION

In the first place, the Toroidal engine is an oscillating type operating on the four-stroke-cycle principle. The cylinders, instead of being straight, are curved in "torus" or ring-form around the crankshaft and, in the present engines, this torus is divided into four independent sections to form the four cylinders.

All four pistons are connected to one arm, which is a plate steel unit, that oscillates back and forth on large bearings at the center of the engine. The motion of this oscillating arm is then transferred to the crankshaft, located above the upper cylinders, by means of a single connecting rod fastened to the arm between these two cylinders. Thus, only one connecting rod is used in place of the

four rods used on a conventional four-cylinder engine.

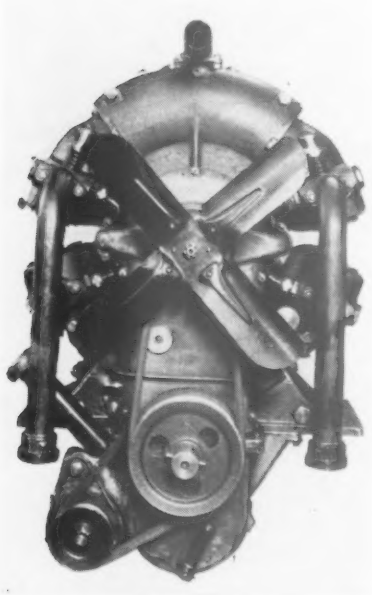
This arm, and the pistons connected with it, are so designed that the pistons move back and forth in a perfect circle and so that the piston barrels do not come into contact with the cylinder at any point. This is one of the most astonishing features of the design and leads to the slogan, "The only engine with a free floating piston."

In fact, a clearance of 1/16-inch, or 0.064-inch clearance is allowed between the piston and cylinder wall. The only friction experienced is that due to the tension of the piston rings. There can be no piston side thrust on the cylinder walls because the connecting rod does not act on the piston directly but only upon the centered arm.

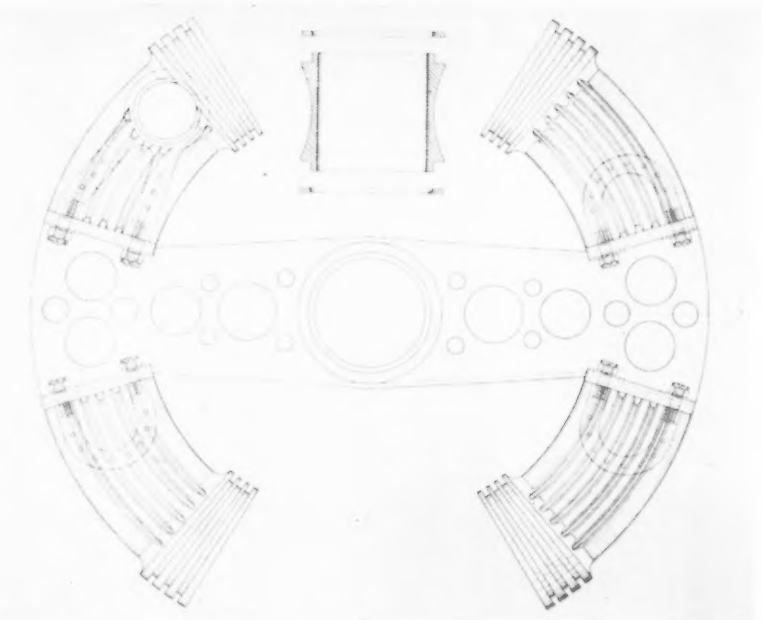
It is said that these engines present no serious machining problems and, in quantity production, should be built as economically as the standard type straight-bore cylinder type.

ADVANTAGES OF THE TOROIDAL ENGINE

1. FULL FLOATING PISTON
   a. Eliminate side-thrust on cylinders.
   b. Greatly reduces cylinder wear.
   c. Reduces frictional surface.
   d. Reduces lubricated area.
   e. Have longer life.
   f. Have greater safety.
   g. Piston seal improves with service.
2. ELIMINATION OF PARTS
   a. One connecting rod for four cylinders.
   b. Four pistons on a single unit.
   c. Only three revolving bearings and two reciprocal bearings in a four cylinder unit.
   d. Only three moving parts to the power assembly of a four cylinder motor.
3. ADAPTABILITY
   a. Adaptable for multiple cylinder engine—tandem, radical, inverted, horizontal or vertical type, and for Diesel work,
   b. Adaptable for either air or water cooled motors.
   c. Adaptable for commercial, heavy duty, aircraft and marine motors.
4. GREATER MECHANICAL AND THERMAL EFFICIENCY
   A. Mechanical—
      a. Parasite work incidental to four stroke cycle engine accomplished by direct action instead of through many bearings and piston friction.
      b. Fewer bearings.
      c. Reduced strain on connecting rod bearing, both wrist pin and crank throw, also with main bearing.
      d. Greater balance due to opposed cylinders, cushioning of piston at end of power stroke by compression, exhaust and intake.
   B. Thermal—
      a. Improved cooling—
         1. Smaller surfaces exposed to heat.
         2 Heat of piston radiated through oscillating arms.
      b. Equal distribution of fuel to cylinders.
      c. Enables use of leaner charge without overheating and gives more complete combustion of fuel.
5. REDUCED COST OF PRODUCTION
   a. Greater number of stamped parts.
   b. Fewer close tolerances in machining operations.
   c. Reduced size of blocks.
   d. Interchangeability and repetition of parts.
   e. Reduced length and weight of pistons and cylinders.
6. REDUCED LUBRICATION PROBLEMS
   a. There being ring contact only with the cylinder walls, there is no obstruction to flow of oil to the ring contact zone, of cylinder walls, no pumping action into the combustion chamber past the pistons, and no burning of oil between the pistons and cylinders.
   b. Fewer bearings to lubricate.
7. EASE IN SECURING STREAMLINE
   a. Less parasitical frontal resistances.
8. REDUCTION IN WEIGHT
9. RIGIDNESS OF CONSTRUCTION
   a. Centers strains and stresses.
   b. Better loading of parts.
10. ACCESSIBILITY OF PARTS FOR MAINTENANCE
11. REDUCTION IN SIZE
   a. Lower bulk per cubic inch displacement.
   b. Diameter does not increase as fast as the displacement.
12. OPERATING ECONOMY
   a. Leaner charge gives better combustion.
   b. Reduced friction gives better fuel economy and less cost for maintenance.
   c. Long lived pistons and cylinders.
   d. Reduced oil consumption.
13. GREATER SAFETY FACTOR
   a. Pistons cannot seize in cylinders under any conditions.
   b. Temporary failure of lubrication cannot stall engine.



Front view of the water-cooled Toroidal engine which drove a Ford car for six months with very good results. The total hours' service during this period was 3,500 hours without an overhaul.



Layout of the toroidal cylinders and a section through one of the pistons showing its reversed "bell" form.

Four eight-cylinder engines are now being built. They will be liquid cooled with a bore and stroke of 4¼ x 4¼ inches and a total displacement of 482 cubic inches. The compression ratio is 6:1.

It is estimated that each of these engines will deliver from 160 to 190 horsepower at 2,200 r.p.m. and will weigh approximately 300 pounds. By supercharging, of course, this output can be increased further.

As soon as these engines are completed, two will be placed in airplanes and operated in constant service to prove their superiority in point of endurance and reliability. One will be sent to the Department of Commerce for tests and an A.T.C. while the remaining engine will probably be used for display and demonstration.

The Campbell All-Metal Low-Wing

by HILLIS R. BRADEN

A brand-new low-priced Ford Motored plane that has been entered in the race for the attention of the so-called air-minded masses. It is a swallow-tailed pusher of fine appearance and excellent performance.

ON the Mid-American Airport, St. Joseph, Missouri, a small airplane comes home to roost each evening, and whether returning from a cross country cruise or from a twenty minute pleasure hop, there is always a group of the curious on the field with their comments, questions, and admonitions concerning the quaint and unique creation of one of the home-town boys, "Sir" Hayden Campbell.

Wherever Campbell goes with his plane, there is always a group of these curious onlookers, pilots and "ground-bugs," mechanics and pay passengers, men and women. After having seen the plane it is easily understood why the bystander always asks as his first question, "Will it really fly?"

When the plane is first seen in the air, all doubt is removed as to whether or not the wings are usuable or purely ornamental. They are very, very usable. There is speed to burn in this ship, ability to get off in a hurry and set down in the smallest of fields, and manueverability and stability in the air. What more could any person ask of an airplane designed for the average citizen, and to fit the average pocketbook?

It is hoped that this job will retail in the neighborhood of $1200 under mass production. Quite naturally this fact places Campbell's ship in the running for Eugene Vidal's quest, in behalf of the Bureau of Air Commerce, for a "poor man's airplane."

The Hayden Campbell plane which has its Ford V-8 engine set in rubber. In this design, the cabin, tail-group and landing-gear are all built around the main motif of the multi-cellular wing. Mr. Campbell is third from the right with his hand resting upon the wing.

As yet, the creation has no given name, but has been called by a dozen different ones during the past few months, including the rather uncomplimentary "Beetle", "Flying Flivver", and so on. We hesitate to call this neat little piece of work by names like those, but perhaps such names will permanently attach themselves to it because of its appearance.

Such a thing happened very recently with the Pou de Ciel, or "Sky Louse", in France. We hope that the "Campbell" is christened before such an occurrence has an opportunity to present itself in this country.

The door opens upon a comfortable and well arranged cabin, suggestive of an automobile coupe. Hayden Campbell is seated in the cabin, explaining his creation to Leonard Jurdin, Bureau of Air Commerce inspector. Note the excellent visibility, largely due to the absence of a nose engine.

Concerning the airplane itself, the motive power is produced by a standard Ford V-8 motor with no conversions whatsoever. With the exception of the fact that the compression has been raised to a 7:1 ratio, and that a special high-lift camshaft with 2:1 reducing gears have been installed, the motor is exactly as it was when she and "Henry" said their last farewells.

The motor is reversed and the pusher prop is at the rear of the fuselage, running off an extension on the drive shaft. The cabin is just in front of the motor in the nose of the ship.

Side-by-side seating on much more comfortable upholstering than is ordinarily seen in any plane, gives the ideal arrangements for the private flyer. Just above and to the rear of the cabin is the radiator, or air-intake. This "scoop" gathers in the air and the suction of the prop combines with the speed of the plane to distribute it where needed.

The fuselage tapers at the back to an eight-inch slit through which used air is drawn. This arrangement also enables the prop to throw itself into a far greater amount of air than has previously been the case with pushers, due to the fact that the tapering of the fuselage of this model distributes the "outside" air to the entire propeller, with the exception of the eight inches

in the exact center. Utilization of this extra footage on the prop naturally aids in performance.

The plane is constructed entirely of metal; dow-metal and dural being used throughout. The dow-metal was imported into Missouri from Michigan. Wood is very conspicuous—because of its absence.

The general shape of the fuselage reminds one of a large egg, partly flattened at the rear. Excellent streamlining has been achieved. The cabin windows have been so placed as to fit into the curvature of the nose, carrying out the streamlining, and creating no more resistance than would have otherwise been placed at this point.

The landing-carriage consists of three wheels, two of which are located to the rear of the center of gravity, but which carry most of the weight. They have the standard sixteen-inch oleo shock-absorbers, while the wheel under the very nose of the ship has only a ten-inch spread.

This wheel does not have the weight on it that the other two have, but helps prevent noscovers. Connected to foot pedals in the cabin, as is the ordinary tail wheel, this wheel is on a pivot and allows very easy and accurate manuevering while on the ground. Air-wheels will come as standard equipment.

Twin rudders are used, being suspended on twin booms extending from the trailing edge of the wing. These extensions are in reality, several joints of metal, each smaller than the one just forward; this construction gives it somewhat of a telescopic appearance. The elevator and stabilizer swing between these booms. All controls are swung on ball bearings.

This plane is virtually a flying-wing, the four major sections of the ship being built entirely around the wing which is, in itself, unusual. Campbell calls it a "fullcantilever, multi-cellular, airfoil". Four transverse metal spars, evenly spaced, run from wing tip to wing tip. These in turn are crossed by the conventional ribs (also metal) at regular intervals, thus creating a veritable "honeycomb" of box-like cells in this wing.

The entire lift is obtained here. The leading and trailing edges are apparently oversize, but are merely formers to carry out the streamlining and general appearance of the entire wing. As previously stated, the entire plane is built around this wing.

The motor is set in rubber on the wing, just allowing the prop enough room to swing clear of the trailing edge between the twin extensions that support the tail group. These extensions run directly into the trailing edge, and are attached to the four wing spars. The cabin is in the same shell with the motor, and the two together are attached around the wing, as seen in the accompanying photos.

The creation has a thirty-foot span.

(*Concluded on page* 219)

Around the Country With the Aero Clubs

News received from the aviation clubs of America that are both interesting and instructive. We ask all aviation clubs for contributions to this department.

The guests of this hotel have brought their airplanes along with them, making their vacation more enjoyable.

WE HAVE had many entries from all sorts of flying clubs except for the three "Flying Flea Clubs" which we understand have been organized recently. Don't be bashful, fellows, come up and tell us how you are getting on with your project.

* * *

DIGGING out a letter from about the center of gravity of the pile, we hold it up to the light and find that it comes from "The Little Rockets," a newly organized flying club located at 1015 West Second St., Little Rock, Ark.

This organization hopes to create more interest in model flying in and about Little Rock, according to E. P. Fancher who sends the information. The club was named in honor of the Little Rocket Cammandaire speed plane which was built in Little Rock and won the American Air Derby a few years back.

E. P. Fancher, Byron Williams and Felton O'Kelly are the sponsors and directors of the club. They have been holding model contests and have aroused quite a bit of interest.

* * *

THE New York Flying Squadron, 153 W. 21st St., New York, N. Y., is composed of 15 young aviation enthusiasts, headed by Jack D. Gasparro, its founder and a graduate of Parks Air College.

They have just started a membership drive which, so far, has proved surprisingly successful. It was in the interest of raising funds for the purchase of a motor. They are just itching to get their hands on a good motor but, as their secretary Carmine Gaeta, wisely says, "Of course, we don't wish to go to the poor-house either." They ask our readers to put them on the track of getting this motor. If such a motor is known, address: New York Flying Squadron, 153 West 21st St., New York City, N. Y.

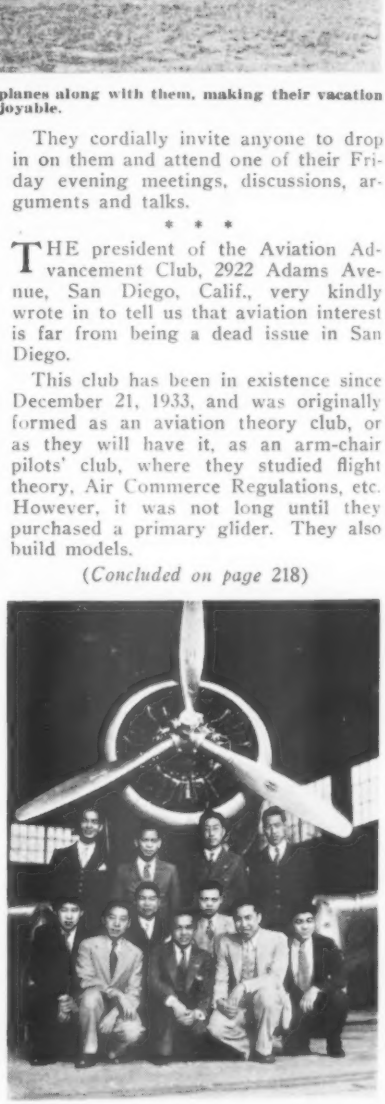
They cordially invite anyone to drop in on them and attend one of their Friday evening meetings, discussions, arguments and talks.

* * *

THE president of the Aviation Advancement Club, 2922 Adams Avenue, San Diego, Calif., very kindly wrote in to tell us that aviation interest is far from being a dead issue in San Diego.

This club has been in existence since December 21, 1933, and was originally formed as an aviation theory club, or as they will have it, as an arm-chair pilots' club, where they studied flight theory, Air Commerce Regulations, etc. However, it was not long until they purchased a primary glider. They also build models.

(*Concluded on page* 218)



The Chinese students of the Curtiss-Wright Technical Institute, Glendale, Calif., have bonded themselves into a thriving aviation club.

Planes That Our Covers Show

by HERMAN R. BOLLIN

Interesting facts about the planes shown on the front and back covers of this issue, facts concerning their mechanical features, purpose and all the other details, down to the significance of the color scheme and insignia.

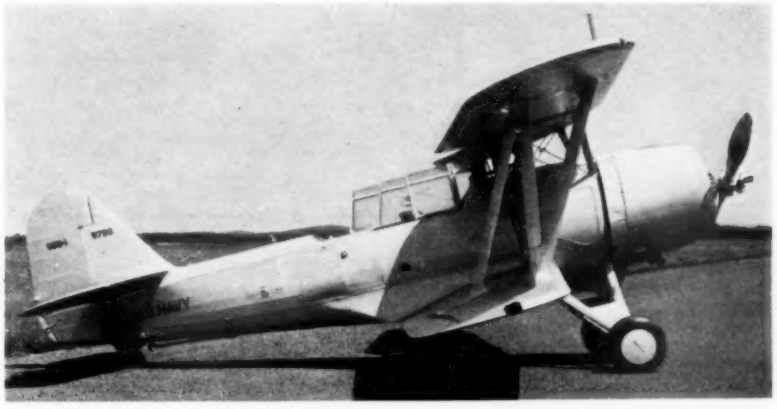
ESPECIAL interest attaches itself to the new Chance Vought scout-bombers, now under construction for the U. S. Navy, not only because of their structural design but also for the reason that they are the successors of the Vought Corsairs that, for so many years, were a standard type on the aircraft-carriers, battleships and cruisers of the U. S. Navy.

This new Vought ship is the result of three years' work in design and testing in close cooperation with the U. S. Bureau of Aeronautics, a division of the U. S. Navy. The present order for 84 of the Model SBU-1 planes is indicative of the confidence of the Navy in this new model.

The SBU-1 is a 2-seater biplane designed with a special view to meet the limitations of a plane intended for landing upon the relatively small decks of the Navy aircraft carriers which demand the utmost in compactness and low landing-speed. It is intended for both bombing and long-range scouting activities, covering the duties formerly assigned to two distinctly different types of planes. This versatility of what is really a two-purpose plane, means much in the economy of naval air operations.

Outstanding among the new features of the SBU-1 is the use of the latest N.A.C.A. cowl with adjustable flaps which permits a higher top speed and the use of full power in climbing without overheating the engine. Another prominent feature is the employment of split flaps on the lower wings which add considerably to the speed range and the ability of the plane to land on small decks. Its structure consists of an all-metal frame, fabric covered, except for the metal covered fixed tail-surfaces. A covered cock-pit, from which excellent visibility is had, is a distinctive feature of the SBU-1.

It would be quite interesting to know just how much the lifting component of the wings is increased by the use of flaps on the lower wing where they are just a short distance above the deck of the ship when landing. This must give a very considerable compression effect as well as additional retardation which are most essential requisites in deck landings. This, at least, is one advantage that cannot be claimed by monoplanes—even low-wing-monoplanes of the most recent type.



Side elevation of the new Vought scout-bomber, Model SBU-1, the successor of the Vought Corsair that, for so many years, was a standard type in the UMS. Navy and in the air-service of other nations.

Looking at the power-plant we find a geared Twin Wasp Junior, rated at 700 h.p. It is equipped with a Hamilton Standard controllable pitch propeller. No information is yet released by the navy on the performance of the plane and will not be until the final tests are completed and digested.

So far as the color scheme is concerned, the three planes shown on the front cover are shown in the correct Navy coloring. The lemon yellow tails signify that these three planes are a part of a squadron attached to the U. S. S. Lexington, in this case, the Third Scouting Squadron.

No. I plane, on the front cover, a plane carrying a red band and a red motor cowl, signifies that this is being flown by the Section Leader. The No. II plane carries only the upper half of the cowl in red, while No. III carries the lower half of the cowl in red. All three planes carry a red chevron on the top wing with the plane number inserted.

A feature of an early issue will be instructions on the method of painting naval aircraft, which I will show in full colors. This article will be of unusual value to those model builders who wish to paint their models according to the authentic code established by the U. S. Navy.

On the back cover, is a colored photograph of the Lockheed "Electra" employed by the Braniff Airways. This bi-motored transport, while the fastest of its class is also the most maneuverable and best flying ships in service on scheduled runs. Each of the vertical surfaces—vertical fixed fin and rudder—is directly behind the motor nacelles so that any tendency toward periodic yawing or "fish-tailing" is quickly damped out.

Unusual, in this type of ship, is the fact that the "Electra" handles very well when close to the ground which makes landings and take-offs a simple matter for the pilot, unattended by the usual elements of danger during these critical moments. All of these qualities, coupled with its exceedingly high speed, have made the "Electra" very popular among the passengers as well as the pilots.

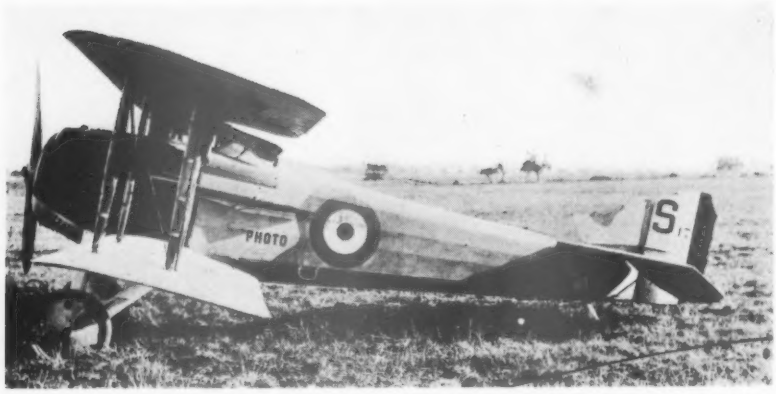
The "Electra" is an all-steel ship descended from a long line of monococque type ancestors, all of which were notable for excellent performance.

Looking at the Vought Model SBU-1 from the side and rear, shows remarkably clean lines.

XUM

Two Interesting Pages of

This little Nieuport, Type No. 21, was caught in this pose just outside of Chalons, France, after a scouting trip in search of reported Zeppelins.



Fitted up with cameras, as a general service ship in the Photo Section, this Spad Type No. 7, was working in the dual capacity of observation plane and pursuit ship.

Meeting a Spad Type No. 13 face-to-face at Agincourt. This is an advanced and well developed type of Spad that gave the "red nosed Fokkers" plenty to worry about. She was the answer to the Allies' prayer.

SPADS and Nieuports! What World War story is complete without mention of these two most famous of all World War planes? The planes used at times by all the Allied Air Forces, French, English and American on all fronts.

But, back of the great wartime success of the Spads and Nieuports were years of experience in the design and construction of planes by the builders of the two ships. Louis Bleriot, renowned "Father of the Monoplane", and Eduoard Nieuport, designer and builder of the Nieuport series, were oldtimers in the game before the war began. Both men had won fame as flyers before 1914, and as engineers long before that time.

The Spad, which is a synthetic name built from the initials of the firm name, Societé pour Aviation et Deriveé; retained Louis Bleriot as consultant during their wartime production. Louis Bleriot, in turn, had won lasting fame by making the first successful cross-channel flight on his Type 11, many years before, and before taking up aviation he was a successful manufacturer of automobile headlights which bore the name "Bleriot Phare". Any old time motorist will tell you of these massive glittering polished brass affairs that marked the cars of the oppulent.

Bleriot had the financial means available for pursuing his hobby. He carried on a great many experiments prior to the war and was really the designer of the present stick-control which was developed from the old Bleriot "Cloche". He designed one of the first successful cabin planes, the "Bleriot Limousine" which was one of the aeronautic wonders of its day. He was a firm believer in the monoplane principle up to the time that the war made new demands upon performance and, the war being over, returned to his first love.

But, for this single diversion from the monoplane, Bleriot had one consistency of design that followed in all his work, that is, he was a staunch adherent of the tractor type plane and the fuselage. Starting with the old Bleriot "11" series, all were fuselage tractor types.

Eduoard Nieuport was also a monoplane believer, strange to say, who relinquished claim on the principle during the war. He built several famous pre-war monoplanes which were also of the fuselage tractor type but which, we believe, were the first planes to display a marked streamline fuselage as we now know it. These early Nieuport monoplanes were exceptionally deep near the front and tapered away toward the rear with true streamline form, and unlike Bleriot's early monoplanes, were completely covered with fabric from nose to tail.

Nieuport was also the first to adopt the thick wing-section, or at least it

Wartime Nieuports and Spads

was a thick wing-section for that time. These early wings gave excellent qualities of structural strength because of the deep wing-beams that the thick sections made possible. And all of the early Nieuports were noted for their efficiency, flying at a high speed with a minimum horsepower.

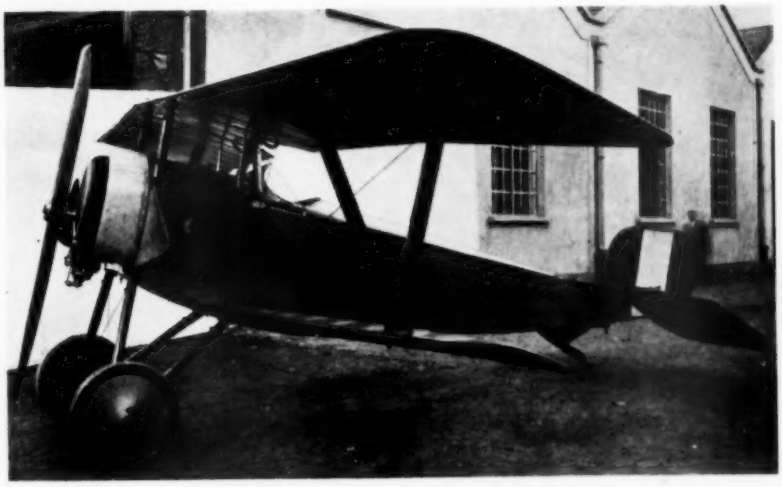
In wartime production, the design of the biplanes showed a marked improvement over the earlier planes. These little pursuit ships both reflected great attention to streamlining and compactness. The Nieuport "scout" still showed the deep fuselage nose and, unwilling to give up the monoplane idea entirely, the Nieuport wartime plane was really a sesquiplane with a short stubby lower wing of short span and narrow chord.

The wartime Spad, however, was a true biplane from front to tail, with equal span wings and typical interplane bracing. It was a complete break-away from the monoplane idea, from the wing aspect to the use of a liquid-cooled engine. And there were a whole series of Spads, differing in detail and dimensions but of the same general layout and contour. They maintained their characteristic radiator construction throughout the series, from the smallest scout to the Spad cannon plane that carried a 37.5 millimeter dust-reactor that fired through the nose.

The Nieuport likewise went through a number of types which, like the Spad, retained their general characteristics. The use of a rotary air-cooled engine was retained in contrast with the liquid-cooled Hissos carried on the majority of Spads. Structurally, the Nieuports were very frail and light, in many instances giving almost an airplane model delicacy in appearance—and sometimes in flight.

The six pictures shown here, represent only a few of the various types of Spads and Nieuports that saw service or that were built experimentally. And these pictures cover a number of different periods of development that in these planes that are noteworthy, particularly in the case of the Nieuport photos. Increased power and speed in the opposing Fokkers naturally called for increased speed and power in the Spads and Nieuports so that the dimensions naturally changed with the increasing engine requirements.

The size of the Hispano-Suiza engines and the power and dimensions of the air-cooled rotary cylinder Gnomes and LaRhones increased steadily as the war progressed to meet the opposing increases in the Mercedes, B.W.M. and other enemy engines. With the heavier and more powerful engines came greater weight, greater wing-span and greater dimensions throughout the ships and it is a question, therefore, just how much longer the conventional Spad and Nieuport designs would have survived.



One of the earliest of the Nieuports, a frail light phantom of a plane with a none too sturdy wing structure.

Three-quarter rear view of the Spad Type No. 13 seen anywhere along the Western Front.

And here we have one of the later Nieuports, Type No. 27, that represents a long period of development.

The New Fokker C.X. Two-Seat Light Bomber

This is the Fokker C.X. sesquiplane recently constructed for fighting, reconnaissance and light bombing missions.

THE latest Fokker product is a general service military plane to be used as a two-seat fighter, for reconnaissance or light bombing. It has a maximum speed of 214 m.p.h., a cruising speed of 180 m.p.h. and a landing speed (with flaps) of 60 m.p.h. Its climbing speed is approximately 1,650 feet per minute.

A Hispano-Suiza 12-cylinder water-cooled engine of 860 h.p. and an engine speed of 2,400 r.p.m. gives this ship its excellent performance. The absolute ceiling is 29,520 feet while the radius of action at cruising speed is 410 miles.

Normal armament consists of one (or two) fixed machine guns for the pilot. It fires between the propeller blades. There is also one flexible machine gun for the observer in the rear-cockpit. The two bomb racks carry a load of 440 pounds of bombs.

French Amateurs Now Building Fordettes

M. BEYDT, Toulouse, France, has just completed a Ford engined lightplane which is now undergoing flight tests. This power-plant gives the little ship a top speed of 69 m.p.h. at an engine speed of 1,800 r.p.m. The landing speed is 26 m.p.h.

Our correspondent tells us that the French amateurs are now building various types of lightplanes, the amateurs now preferring planes of the new Farman or Potez "60" type to the "Flying Flea" which, by the way, is now undergoing its official tests by the government.

The many fatal accidents with the "Flying Flea" have largely discredited that type, and have demanded a complete revision of the "Flea," but they have certainly stimulated lightplane building in France which alone is a great achievement.

The Beydt Ford plane shown here, shows the trend away from the "Flying Flea" type. It has a span of 32'0" and a length of 20'8". It will be interesting to find out just how popular auto engine conversions will prove in France where there are so many fine lightplane engines at reasonable prices.

Introducing the "Beydt" French lightplane powered by a Ford "A" engine.

Cachet Notice

IN response to wide popular request, POPULAR AVIATION, Chicago, Ill., will sponsor a series of Cachets of the beautiful Official Insignia of all branches of the U. S. Air Corps in their original colors printed by lithograph.

The first set of five different will be those of the Squadrons of the 1st Pursuit Group stationed at Selfridge Field, Mich. (17th, 27th, 94th Pursuit Squadrons, 57th Service Squadron and Group Headquarters). The signature of the Group Commander, Lieut.-Colonel Ralph Royce, Famous World War Commander, will be on all covers and will be mailed from Selfridge Field, March 31st, 1936, deadline March 25th, 1936.

Send any size or number of covers using any amount of postage, addressed in the lower right corner and stamped in the upper right corner. A service and forwarding charge of 7c per cover or 35c for the set to cover actual cost must be enclosed in stamps, money order or coin. Send covers unstuffed and unsealed with no postage dues. Specify which Insignia are desired.

All newspapers and magazines please copy. Requests for cachets should be addressed to Philatelic Dept., POPULAR AVIATION, 608 S. Dearborn St., Chicago, Ill.

Razor Static

HENCEFORTH, pilots participating in the army's General Headquarters Air-force maneuvers will not shave with "new-fangled" razors during mimic aerial attacks.

During maneuvers in Southern Florida, the radio communications became disrupted by static coming from some unaccountable source. Investigation showed that a pilot off duty was shaving with an electric razor and Brig. Gen. H. H. Arnold, commanding officer of the bombardment wing at Vero Beach made every man swear off this "high-powered shaving" until the maneuvers were over.

Audible Stall Indicator

AFTER testing the Flying Wing the installation of a ventilator tube was found to be necessary. This tube has a diameter of two inches and a length of three feet. The intake is placed at the leading edge of the wing and the outlet in the cabin on the left side of the pilot.

The ventilation is very satisfactory and accidentally the tube serves as a stall indicator by emitting a deep tone when reaching the stall angle, thus indicating a major change of airflow.

This phenomenon may be applied to designing a simple and inexpensive audible stall indicator mounted on the leading edge at a predetermined point found by laboratory tests or mounted as a unit outside of the plane adjusted by the method of "cut-and-try."

This type of air-speed meter is very sharp, accurate and critical in its readings because the sudden fluctuation in the air-stream direction at the double-points causes a quick difference in sound.

A Fable Not In Slang

by Major H. H. Woeltjen

The law that makes heroes out of bums can make criminals out of honest men

THE two young men were quite satisfied that at last everything was in readiness and that the moment had now arrived that was to make history.

All through the Spring and Summer of 1903 they had toiled but now at last they were to reap the fruits of their labors. The jeers of their neighbors still rankled but that is the fate of all pioneers, for only after a thing is done and an established fact, will the public say "I told you so, I knew they would do it."

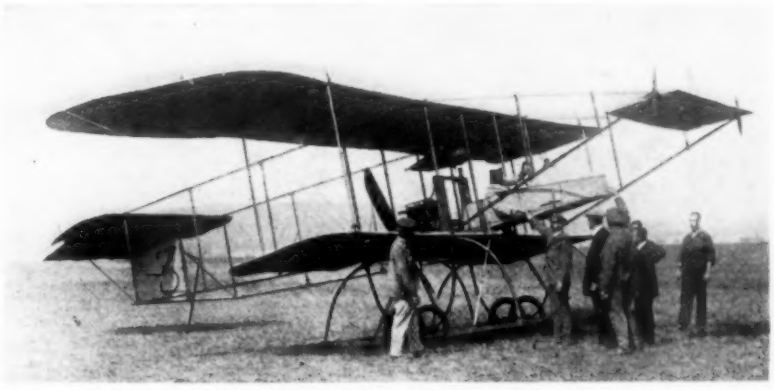
The younger of the two men had just seated himself in the contraption which they had dubbed "aeroplane" and were about to open the throttle when they beheld a bright golden star, followed by a man running toward them, waving wildly, "Hey there fellows, you can't fly that thing without a license, you haven't even got identification numbers on it. Don't you know the law?"

"And who may you be?" queried the older shading his eyes from the glare of the star.

"I am a States Aeronautics Inspector," that's who I am. "Now pull that crate back into your barn and don't let me catch you flying it or I'll have the sheriff lock up both of you. Get a license first boys, then you can break your necks for all I care."

"A license? What kind of a license do we need? You see this is a brand new idea and it has never been tried out before," remarked the younger lad as he shut off the engine. "How do we get a license?"

"Why, write to the Department of Commerce, of course," remarked the inspector, "send in your drawings to Washington so that everybody can see what you are trying to invent, together with your stress analysis of the ship. If you intend to manufacture it with an A.T.C. rating, send along another ship and after they play around with it, if there is anything left, you might get it back."



Hey, there, fellows, you haven't got a license.

"What's a stress analysis?" Gee, but you guys are dumb. Well let's see, its this way: First you guess what strains it will get on the ground and while flying, (If it flies,) then you figure out how strong the parts must be to stand the strain, then you add 20 percent. for errors, then multiply it all by ten or twenty to give a factor of safety and then, if it still don't look strong enough, just make everything a little heavier here and there. If that makes it look too clumsy, streamline it with balsa wood or sheet aluminum."

"Send all your figures and dimensions to the D of C to play with and, if they can guess what your figures mean, you lose and they may make you multiply everything by ten again. However, if they can't make head or tail out of it, they will then congratulate you and ask that you submit a signed statement setting forth that all your work is done in accordance with standard practice." When that is done, you will get your experimental "X" license—in a year or two."

"You say this isn't made according to "standard practices" and that it is an entirely new idea?" "Gee, you boys are sure out of luck." You've got to make it standard because their rules say so and anyway how can they let you experiment on something new if they don't understand it themselves.

"You say you don't know yourself if it will fly or not." "Just get your license, our state law says that any airplane with a D. C. license can fly, so don't worry about that." "The law reads that "any

A Flying Flea that parades under the Spanish name for "Cockroach." Verily, this name business is getting worse and worse.

licensed pilot can fly a licensed plane." "What! you're not licensed pilots? you guys sure are lucky that I caught you before you tried flying that thing, it would have gone hard with you otherwise."

"You say that no one has ever flown an airplane before? How can you learn to fly that thing if it has never been flown before? Gee, that's tough. Wait a minute, I have it. Why don't you fellows take a library-book course in flying? That ought to fill the bill. You fellows sure need a bright fellow like me to figure out things for you." "Thanks for the Seegar."

"Well, now let's see:—Wait a minute, wait a minute, that crate will never pass inspection with that wooden fuselage." The rules specifically say that the fuselage must be of chromium tubing, Why?, don't ask me, the rules say so don't they, besides I guess the steel manufacturers must make money somehow."

"Why must the fuselage be made out of steel when the wings can be made with wooden spars? Don't ask me, I guess maybe they overlooked that. Anyhow its easy to see, steel would make the wings too heavy and as the wings carry the load in the air they must be light enough not to fall down when the plane is on the ground. See, they only use one "landing wire" on the ground and twice as many while flying." "You see all the strain of flying is on the flying wires whether flying straight or upside down. That's why they are called flying wires," and that's why they are doubled.

"Coming back to the stress analysis, you say that if you multiply everything by ten or twenty for a safety factor your plane would be too heavy?" "Well add a little more power and then if the strain of that is too great increase the dimensions of your structure and its fittings and then if it gets too heavy again, add more power and so on until you get the right combination. That's how modern planes will be built."

"By the way who of you is the licensed A & E mechanic that assembled and rigged this job?" No one? Gee fellows, now get wise to yourselves before you get into trouble, burn that crate, and leave the flying to the airlines and experimenting to the guys who can get a subsidy from the democratic party, take an armchair course in flying and then when you have your diploma, the airlines will hire you when they get started or maybe you can get into Kelly Field."

"What's the use of building a plane anyway, or learning to fly when you can't land on the municipal airport unless you carry a radio, get a court order for permission to land or take off, belong to the A A A, C G F C, or W C T U."

Shaking his head sadly he left them and, the brothers looking sadly at each other, quietly built a bonfire underneath their cherished dream and after seeing it go up into smoke, slowly walked away.

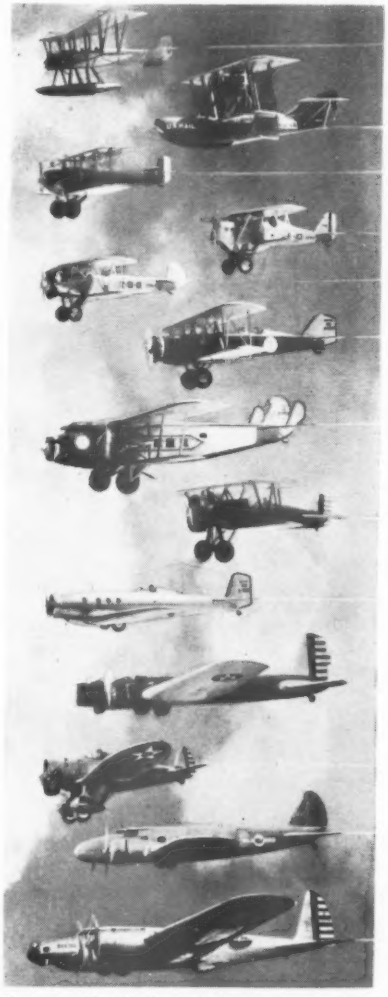
(Concluded on page 210)

Milestones in Boeing Progress

STRIDES made in military and commercial aircraft design and construction, since the days of the World War are, graphically shown in this review of outstanding Boeing models.

From top to bottom: The first Boeing plane of 1916; the historic B-1 flying boat of 1919, operated on the first privately contracted international air mail route, between Seattle and Victoria, B. C.; the MB-3A Army pursuit of 1920-21; the FB-5 Navy carrier fighter of 1926-27; the F3B-1 Navy carrier fighter of 1927-28; the 40-B4 of 1929, which pioneered air transportation on the coast-to-coast and Pacific Coast routes now operated by United Air Lines; the 80-A of 1929-30, "pioneer Pullman of the air," which introduced 27-hour coast-to-coast service on United's mid-continent route; the P-12C pursuit of 1930-31, noted for speed and maneuverability; the Monomail of 1931-32, forerunner of the all-metal, twin-engined commercial and military types of today and first successful smooth-skin transport with retractable landing gear; the high-speed twin-engined Y1B-9A bomber of 1931-32 which established the current trend in bombing ailcraft; the P-26A pursuit of 1933-35, now used at Army Air Corps bases over the country; the 247-D transport of 1935 with a top speed of 202 miles an hour, which today is used by United Air Lines and other operators in this country and abroad; the 299 four-engined bomber of 1935, fastest and longest range bomber ever built and largest landplane in America. Equipped with four 750 h.p. Hornet engines, this "flying fortress" proved a sensation when it flew the 2100 miles from Seattle to Dayton, Ohio, without a stop at an average speed of more than 232 miles an hour.

From a primitive creation of wood and fabric to the latest transport plane, built wholly of metal, is a long step within comparatively few years. The Boeing plant literally grew up with aviation and at all times kept apace of progress.



Here are the Boeing airplanes arranged in chronological order, starting with the first seaplane of 1916 (at the top) and ending with the giant Boeing bomber of 1935 (at the bottom). This is a concise history of airplane development within itself.

An American Rotor Type Plane

A MOST unusual design of a rotor type plane has recently been completed by Lewis Leonard, 2300 Alamo Bldg., San Antonio, Texas. The refinements in the design were brought about by the many experiments made in the inventor's home-made wind-tunnel and water tow-basin.

This "Rotorplane" is distinctly different from the rotor craft of Cierva or Wilford and is also different from the Vertiplane. It represents 17 years of work by Mr. Leonard who has taken out patents on the idea and who is about to start the construction on an experimental ship.

In the first place, the power-plant (with the rotor), are separate from the main fuselage, and the relative positions of the engine nacelle and the fuselage are controlled by a one-way control wheel, thereby eliminating the rudder-bar and rudder. Lateral control is attained by tilting the upper engine nacelle: right or left by the control wheel and, at the same time, the directional control is inherent. This directional control (without rudder) is had by shifting the thrust line of the propeller to one side or other of the center-line.

Ascent or descent are had by pulling the engine nacelle back or forth, tilting the rotor so that it "slips" air on the desired side. The lower nacelle is "free floating" by means of the large vertical fin. The fuselage automatically weathervanes around the ball bearing mountings.

The World's Planes and Builders

In this concluding tabulation, continued from the February issue of POPULAR AVIATION, will be found the principal airplane builders of most of the remaining countries.

RUMANIA		
Societate Anonima Industria Aeronautica Romana, Str. Anastasie Simu No. 6.	I.A.R.14.	1-seat fighter used for training. Same as I.A.R.16 but fitted with Lorraine 12.Ebwater-cooled engine.
	I.A.R.15.	1-seat high-performance fighter monoplane.
	I.A.R.16.	1-seat fighter monoplane.
	I.A.R.22.	2-seat training monoplane.
	I.A.R.23.	2-seat monoplane.
Fabrica DeAvioane S.E.T., Str. Popa Lazar 13-15, Bucharest.	S.E.T. X.	1-seat fighter training biplane.
	S.E.T. XV.	1-seat fighter biplane.
	S.E.T. 7.	2-seat advanced training biplane.
	S.E.T. 7K.	2-seat observation biplane.
	S.E.T. 10.	2-seat primary training biplane.
	S.E.T. 31.	2-seat advanced training biplane.
RUSSIA		
The Central Aero Hydrodynamics Inst., Vosnessenskaya 17, Moscow.	A.N.T. 9.	3-engine cabin monoplane.
	A.N.T. 14.	5-engine 36-passenger monoplane.
	A.N.T. 15 ("Maxim Gorky").	All-metal monoplane.
Osoaviachim, Moscow.	Air 5.	4-seat cabin monoplane.
	Air 6.	Small edition of the Air 5.
	Air 7.	2-seat high-performance monoplane.
Plant C. H. (formerly Kalinin), Kharkov.	Kalinin K-5.	1-engine 10-seat commercial monoplane.
	Kalinin K-6.	1-engine mail-carrying monoplane.
	Kalinin K-9.	2-seat light monoplane.
The Scientific Research Institute of the Civil Air Fleet.	STAL-2.	5-seat cabin monoplane.
SCOTLAND		
G. & J. Weir, Ltd., Cathcart, Glasgow.	Weir Light Autogiro.	1-seat light autogiro.
SIAM (None).		
SPAIN		
Construcciones Aeronauticas S. A., Arlaban 7, Madrid.	C.A.S.A. Light Monoplane.	2-seat light monoplane.
Sociedad La Hispano-Suiza S. A., Calle de Ribas, 279, Barcelona (Sagrera).	Nieuport-Delage 52C.1. (Under license from the French Nieuport Company.)	1-seat fighter.
	E-30-H.	2-seat advanced training monoplane.
Dr. Jorge Loring, Antonio Maura 18, Madrid.	Loring R-3.	2-seat observation biplane.
SWEDEN		
A. B. Flygindustri, Limhamn (Malmoe).	Junkers K-43.	1-engine observation landplane or seaplane.
	Junkers K-47.	High-performance 2-seat fighter.
Aktiebolaget Svenska Järnvägsverkstderna, Linkoping.	The Svenska "Jaktfalk".	1-seat fighter biplane.
	Svenska "Pirat".	2-seat training or fighting landplane or seaplane.
	Svenska "Falken".	2-seat school and training landplane.
	Svenska "Viking".	3-seat light cabin monoplane.
SWITZERLAND		
Alfred Comte (Schweizerische Flugzeugfabrik), Oberrieden (Zurich).	Comte A.C.8.	6-seat cabin monoplane.
	Comte A.C.12 "Moskito".	3-seat light monoplane.
	Comte A.C.11-V.	1-engine monoplane.
A. G. fur Dornier-Flugzeuge, Zurich.	Dornier Do.X.	2-engine flying-boat.
	Dornier Do.Y.	3-engine 4-seat bomber.
	Dornier Do.C.4.	2-seat fighter.
W. Farner, Granges (Soleure).	W.F. 11.	2-seat light biplane.
TURKEY (None).		
U. S. A. For complete list of aircraft manufacturers in the U. S. A. see the July, 1935, issue of POPULAR AVIATION.		
URUGUAY (None).		
VENEZUELA (None).		
YUGOSLAVIA		
Prva Srpska Fabrika Aeroplana Zivojin Rogozarski, Knez Danilova, 29, Belgrade.	The Rogozarski Biplane.	2-seat observation biplane.

Much of the valuable information appearing in this list was obtained from the latest edition of "Jane's All the World's Aircraft", to whom we express our appreciation.

END.

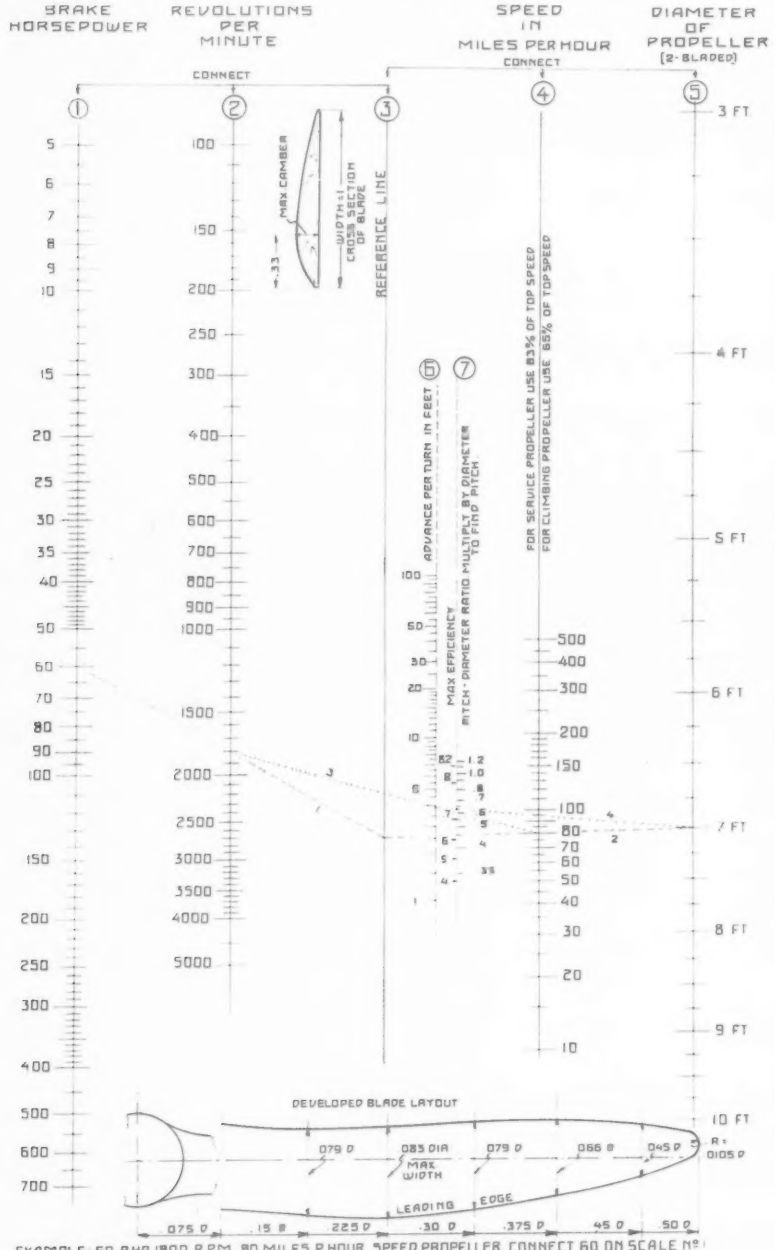
Nomograph for Propeller Design
by RAOUL J. HOFFMAN

THIS chart is more complicated than the graphs published previously. This will design your propeller by carefully following the example worked out on the lower end of the nomograph.

It will help you find the diameter required, the maximum efficiency available, the pitch-diameter ratio from which you may figure the geometrical pitch necessary to lay out your propeller.

Multiplying the constants given in the sketch by the diameter you will get the developed blade of the propeller.

This is not only of value to lightplane builders, but it also will be of assistance to that new group of flight enthusiasts who are now building gas-power models. Only slight modifications are necessary for the gas models. This chart is third in a series of charts.


BRAKE HORSEPOWER
REVOLUTIONS PER MINUTE
SPEED IN MILES PER HOUR
DIAMETER OF PROPELLER (2-BLADED)
CONNECT
MAX CAMBER
WIDTH of CROSS SECTION OF BLADE
REFERENCE LINE
ADVANCE PER TURN IN FEET
MAX EFFICIENCY
PITCH - DIAMETER RATIO MULTIPLY BY DIAMETER TO FIND PITCH
FOR SERVICE PROPELLER USE 83% OF TOP SPEED
FOR CLIMBING PROPELLER USE 66% OF TOP SPEED
DEVELOPED BLADE LAYOUT
MAX WIDTH
LEADING EDGE

EXAMPLE 60 BHP. 1800 R.P.M. 80 MILES P HOUR SPEED PROPELLER CONNECT 60 ON SCALE Nº1 WITH 1800 ON SCALE Nº2 INTERSECTING REFERENCE LINE Nº3. THEN POINT ON REFLINE WITH 80 ON SCALE Nº4. THEN YOU WILL FIND THE LINE PASSING THRU 7 FT. ON SCALE Nº5. WHICH IS THE DIAMETER THEN CONNECT 1800 ON SCALE Nº2 WITH 80 ON SCALE Nº4 THRU 3.9 ON SCALE Nº6 THEN 3.9 ON SCALE Nº6 WITH 7 ON SCALE Nº5 INTERSECTING SCALE Nº7 AT .63. 7FT TIMES .63 EQUALS 53 INCHES GEOMETRICAL PITCH, .74 EFFICIENCY

Pyratone Tempered Wood

BY a new process and the use of plastics in the treatment of wood, several of the characteristic qualities of the wood are much improved.

One of the most marked improvements is the great hardness given to the surface of the wood which gives resiliency and resistance to chipping and splitting. The process also gives greater resistance to bending stresses and resistance to moisture absorption warping, while all of the natural lightness of the wood remains. It is possible to give the hardened surfaces a high polish and enduring gloss which beautifully develops the natural grain of the wood.

Wood, when treated in this way, is known commercially as "Temp-urd-wood", a treatment developed by the Pyratone Products Corporation, 309-319 St. Johns Court, Chicago, Ill. The process is now undergoing tests by several of the largest air-craft manufacturers in this country.

Tests made at the Forest Products, Laboratory, U. S. Department of Agriculture, Madison, Wis., show very remarkable results. The hardness was increased 53-percent. while the perpendicular compressive resistance was increased by 65-percent. The fiber stress at the elastic limit, parallel compression, increased 14-percent.

With a double coating, the moisture is reduced to a negligible quantity and the resistance to moisture is then so great that, with six weeks' immersion in water, the moisture content of the wood only increases to 8-percent.

"Tall Men" Endorse Berths in New Sleeper Planes

IT may be true that "nobody loves a fat man," but it is absolutely certain that everyone has sympathy for the tall man who must imitate a jacknife to wedge himself within the confines of a short bed or berth.

For this reason, William Littlewood, chief engineer of American Airlines, took pleasure in announcing that officers of the "Tall Men's Association" have inspected the approved berths designed for the new fleet of super-sleeper planes now being built for his company by the Douglas Aircraft Company.

The "Tall Men's Association" is a national organization of men who measure more than six feet, created for the avowed aim "To make life more comfortable for tall men." In a letter to Littlewood, Benjamin Ostlind, of Marshfield, Ore., president of the association told of his visit to the Santa Monica factory where he tested one of the new berths from the standpoint of a "Longfellow."

"The berth was made up and I tried it out," Ostlind said. "It was a real thrill to be able to stretch out full length and, on behalf of the Tall Men, I want to compliment you on your initiative in lengthening out the berths on your new sleeper transport."

Benny Howard's Ships in the Raw

by FRED STERLING

A few photographs, taken in the shop, of two Howard racing ships under construction and repair. You've all seen the outside, now let's look at the inside. Photos by A. V. Schmidt.

MOST of our air-race fans have, at some time or other, seen Benny Howard's marvelous little speedsters scooting around the pylons and, what is more, coming over the tape as winners. These ships have probably received more publicity, and rightly so, than any other racers built in America with the possible exception of the late lamented "Gee-Bees."

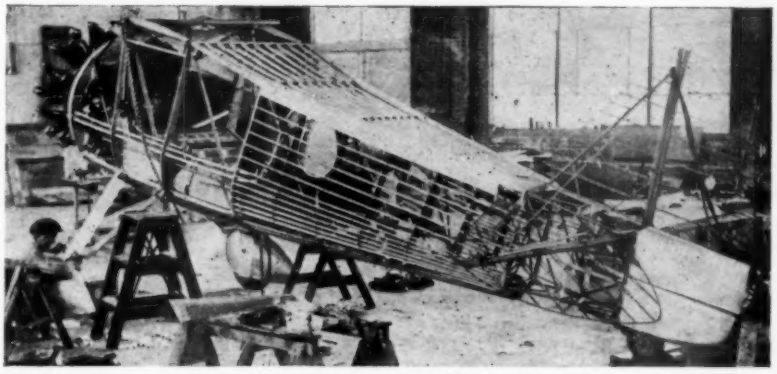
But here are some pictures that plainly delineate something that few of you have witnessed. This something is the uncovered and exposed internal organs of "Mike" and "Mr. Mulligan," just as they appear to the hard-eyed unromantic mechanic. In a manner of speaking, this is an exposure of the Howard ships in which all of the bare facts are uncovered. Mr. Mulligan, in full activity, was shown on our front cover a few months ago, and we also had a model of this little plane in our model section. As for "Mike," he has appeared from time to time on many occasions in the past.

These pictures all go to show the mass of detailed mechanism that is in the make-up of an airplane and the tremendous number of parts that must be fabricated before the plane takes wing. For example, there are yards and yards of fairing strips along the rear portion of the fuselage and we haven't even approached the similarly complicated wing structure.

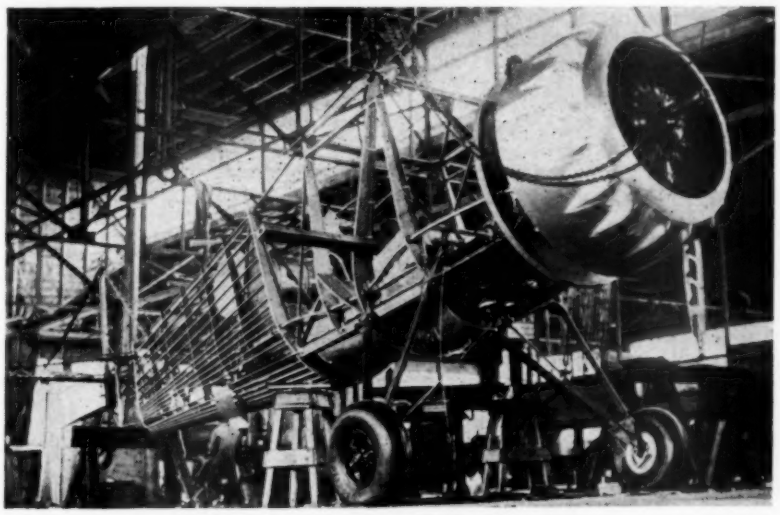
The change of section, at the point where the cabin occurs in Mr. Mulligan, is particularly interesting because of the curved edge fairing ribs. The difference between the arrangement of Mr. Mulligan and Mike are at once apparent, particularly in respect to the tank arrangement and location. "Mike" carries fewer fairing strips and is altogether, the simpler construction of the two ships.

This suggests the idea that, when airplanes go into mass production, this mass of assembled fittings must be simplified if the cost of a plane is to be much reduced. Perhaps, the plane of the future will be a simple monococque type or even a molded form, consisting of some synthetic resin molded between hot dies and turned out with the rapidity of frankfurters in a sausage factory. However desirable present constructions may be, from the standpoint of weight and adaptability, we can never hope to put them into volume production with as many structural members as now exist.

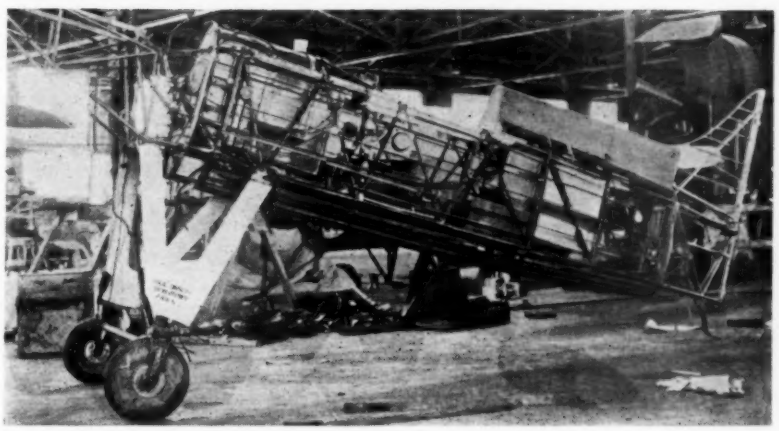
During the time that the Ford trimotor was being produced at Dearborn, Mich., the ingenious Ford engineers eliminated much of the usual complication found in big ships, and when cleaned out, jigs and assembly fixtures were devised for the assembly.



Here are the bones of Mr. Mulligan, DGA-6, while he was undergoing construction at the American Eagle Plant.

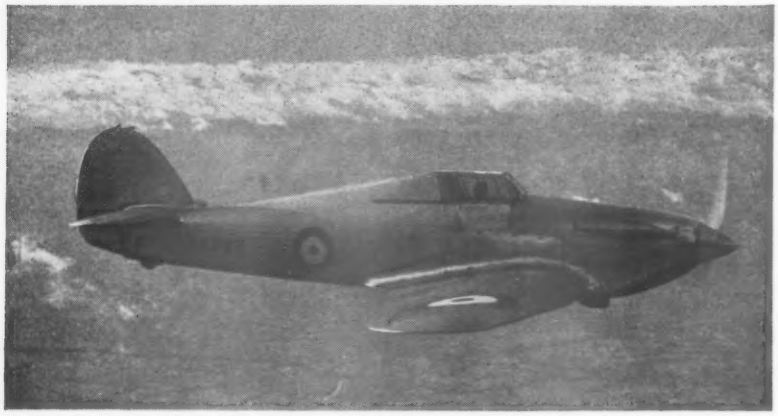


Another view of Mr. Mulligan's articulations.



You all remember Benny Howard's little racer "Mike," don't you? Well, here is "Mike" undergoing a major operation in Kansas City, Kan.

The New Hawker Single-Seat Fighter



The new Hawker single-seat fighter undergoing a test flight at the hands of Flight Lieut. P. W. S. Bulman. A retractable landing gear and a new type cockpit enclosure are effective in developing the tremendous speed shown in the trials.

THE MERLIN, said to be the fastest single-seat fighter in the world, is the latest Hawker military monoplane to be tested for the British Air Forces. It is shown here, as it appeared while undergoing test flights by the noted British test-pilot, Flight Lieut. P. W. S. Bulman.

The total enclosure of the pilot, plus the retractable landing-gear, reduces the flight resistance to a minimum. It is propelled by a 12-cylinder Rolls-Royce supercharged engine carried within the typical British form of nose.

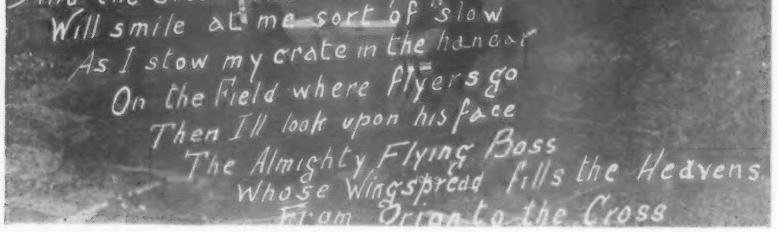
The method of attaching the fillets between the wing and body is unusual.

Do You Recall the Air-Man's Hymn?

WE are glad to have an opportunity of presenting this poem, so well known to the old-timers, and only hope that the younger generation will find it of as much interest and beauty as did their fathers. Years ago, a version of this poem was treasured in many pilots' scrapbooks. I wonder if they are still preserved?

This particular copy came from Selfridge Field and is the property of one of the members of a pursuit squadron who asked us not to reveal his name. Why the secrecy and seclusiveness, we do not know, but we will respect his wishes just the same.

Well, here it goes and we wonder how many more note-books will retain a copy.



An Air-man's Hymn

When the last Long Flight is over
And the happy landings past
And my alimeter tells me
That the crack-ups come at last
I'll swing her nose for the ceiling
And ill give my crate the gun
I'll open her up and let her zoom
For the Air Port of the sun
And the Great God of Flying Men
Will smile at me sort of slow
As I stow my crate in the hangar
On the Field where flyers go
Then I'll look upon his face
The Almighty Flying Boss
Whose Wingspread fills the Heavens
From Orion to the Cross

A Slang Dictionary

REVS. Revolutions per minute.
REVVING-UP. To increase the speed of the engine.
R.H. Abbreviation for right-hand.
RIG. To assemble and align an airplane.
RIGGER. An airplane assembler.
RIGGER'S ANGLE. The angle made by the chord of a wing with a fixed line on the ship. This is the ANGLE OF INCIDENCE.
RIP-CHORD. (1) A cord, which when pulled, releases the parachute from the pack. (2) A cord, which when pulled, tears open a seam or gore of a balloon so as to deflate the balloon quickly when making a landing.
ROCKET. To zoom or climb quickly along a vertical line.
ROOF. The ceiling, or the highest altitude to which an aircraft can ascend.
S.A.E. Abbreviation for Society of Automotive Engineers.
SAFETY. To secure a part against loosening by vibration, to secure a nut by a cotter-pin or lock-wire.
SAIL. To glide or soar without the aid of an engine.
SAIL-PLANE. A glider designed for utilizing the upcoming thermal air currents for support. A soaring glider.
SAUSAGE-BALLOON. A captive balloon with a cylindrical bag used as an observation balloon during the war.
SAWMILL. An engine with more than five cylinders, socalled in the early days because of the continuous high-pitched whine of engines with more than five cylinders.
SCREW. A helical type propeller. Socalled because it traces a screw like helix through the air.
SEAPLANE. An airplane provided with small hulls or pontoons for landing on the water. The pontoons are attached in a manner similar to that of the landing-gear wheels and differs from the occupied hull of a flying-boat.
SESQUIPLANE. A special form of biplane with a lower wing of very short span and narrow chord.
SETTLE. To descend slowly along a vertical path.
SET-BACK. A type of wing in which the outer tips of the wings retreat or are inclined to the rear. Also known as SWEEP-BACK.
SHFT. Abbreviation for shaft.
SHIP. Nickname for an aircraft of any type.
SIDE-SLIP. To descend with the wings tipped up in vertical position, in order to lose altitude without gaining forward speed.
S-ING. To fly along a zig-zag path from right to left.
SILKWORM. A parachute jumper, so named from the fact that most parachutes are made of silk.
SKID. To slide sidewise in making a turn.
SKY-WRITER. A pilot who traces letters and sentences in the air by smoke trails.
SKID-CURTAINS. Any vertical surface intended to stop skidding.
SKIDS. Sled-like runners used with the landing gear of early planes.
SLACK-OFF. To loosen.
SLIP. The amount by which the propeller fails to travel forward in respect to its normal pitch. The difference between the theoretical and actual pitch of a propeller.
SLIP-STREAM. The wind or air stream projected by a revolving propeller.
SLIVVER-SLEEVES. Bands of tape wrapped around a wooden beam or strut to prevent the slivvers from flying in case of breakage.
SLOPPY CONTROLS. When an airplane loses its forward speed, there is no longer any air-pressure on the rudder, ailerons or elevators, hence they feel "sloppy". This is an indication of a stalled plane.
SLOPPY RIGGED. In certain early planes, the stay wires were intentionally left loose or "Sloppy" in order to reduce the stress in these wires.
SLOTS. Small dampers placed on the nose of a wing for the control of the air-stream passing over the wing, thus making it possible to fly at angles of greater lift without stalling.
SNOOTY. A tendency of the plane to fly nose up. (Tail heavy.)
SOCK. A cloth cone-like pennant (wind-sock) which is used for indicating the direction of the surface wind.
SOLO. (1) To fly alone. (2) The first trip of a student made without the instructor.
SOLO-TIME. The number of hours flying alone or without an instructor in the plane.
SOUP. A dense fog.
SOUPY. Heavy foggy weather.
SOUP-UP. To re-adjust to obtain the maximum speed or maximum output.
SQUADRON. A group of planes forming a military unit, the number of planes forming a squadron varying in different countries.
SQUAWK-SHEET. A list of repairs and adjustments handed to the mechanic.
STACK. An exhaust manifold that discharges the exhaust gases over the upper wing.
STICK. (1) The control lever handled by the pilot.

Letters From Our Readers

Every month, we will publish letters, picked at random from our correspondence, that seem to be of particular value to others of our readers. Many of these letters have a highly original viewpoint that merits discussion.

STARTING off with this month's correspondence, we particularly note the contents of a letter from the Philatelic News Bureau, East Orange, N. J., which suggests an excellent idea for the promotion of our airmail. Mr. Farley's attention is particularly requested to this unless he is too busy with the present political campaign.

We would like to see the postoffice department take up airmail parcel post. It wouldn't be necessary to make any difficult rules for the public to misunderstand—I'd just take the current parcel post rate and multiply it by three—for a rough example. You'd see a wonderful business develop.

This speeding up of parcels would bring in a considerable revenue, but most important of all, it would employ personnel and equipment not now being used. There are planes in storage capable of 125 m.p.h. that would be fine for this winged bundle service. Why not try it, Mr. Farley?

But we have a sneaking idea that this is not all that is in our correspondent's head. We'll bet a doughnut that the main idea connected with this promotion is a whole flock of nice new parcel-post stamps for the collectors of philatelic group—how about it fellows?

* * *

AND now the pile of letters yields a bit of old time lightplane dope from the pen, or rather typewriter, of Jim Wommack, 9 Wrightsville Ave., Wilmington, N. C., who accompanies his scenario with a picture of an old lightplane dating back to 1927.

He tells us that this plane was built by Mr. Claude Goodman, Wilmington, N. C., and that it was powered with an Indian motorcycle engine.

I read your magazine with great interest each month. I am an aircraft photo collector and would like to contribute something to your "What Our Readers Are Building" column.

Inclosed is a snapshot of a lightplane built in 1927 here in Wilmington. The builder is Mr. Claud Goodman. You can see by this photo that lightplane building was even in practice then. It is powered with an Indian motorcycle engine.

However, they were building lightplanes a long time before 1927, and as a point of history, 1927 is rather a recent date. J. B. R., of 'ole P. A. was in full production in 1909, and there were a whole flock before him. Thanks, Jim.

* * *

AND here's glad news from a state that does not pester and harass its home-builders or amateur flyers—'ole Virginny, to be exact. Mr. W. B. Bullock, 2716 Memorial Ave., Lynchburg, Va., gives us some excellent ideas on state laws and how to remove their stinger. He says:

Here's an old time lightplane photo, submitted by reader Jim Wommack, Wilmington, N. C.

I have just finished reading my new copy of POPULAR AVIATION, *and after reading Mr. Westphal's article on Gliding and on the very simple way to get around the restrictions that the Department of Commerce has laid down on gliders, I think that it would be an excellent idea for the amateur lightplane builders to give this plan serious thought.*

Here in Virginia, we are not bothered by the regulations that some states have. We are free to build what we choose and fly when and where we want to. What has most of us worried around this section is that we don't know how long this is going to last.

At the present time, we have three ships under construction, all of different design, two monoplanes and one biplane, both steel and wood construction, and rather than have these ships suddenly restricted under foolish air regulations, I intend to form an association here and approach the Governor of the State about the situation and—if necessary—see Mr. Vidal.

I think that if the amateurs of each state, having laws governing flying of homebuilt aircraft, would get together and send a committee to the State officials that it could gradually be ironed out, or let the committee go to Washington and talk up a plan like Mr. Westphal has about the gliders. I believe that enough pressure exerted in the right place will surely cause a great change in the air regulations governing private flying of homebuilt ships.

We always thought that Speed's idea was fine on the glider situation and are glad to have so many agree on this subject. The great trouble is to get support from the lightplane builders themselves who, strangely enough, give no assistance to associations who endeavor to rectify the situation.

This association idea has been tried many times with the members enthusiastic and rarin' to go at the beginning, but distinctly losing interest as soon as there was any work to be done or money to be contributed.

* * *

NOW, we have a letter from Dr. J. E. Guy, 570 Lexington Ave., New York, N. Y., that will make a great hit with our Flying Flea fans and lightplaners. It tells of the doctor's personal acquaintance and friendship with Henri Mignet, the designer of the most popular small plane of the present time.

The article accompanying the photograph of a "Pou du Ciel" lined up in front of a Douglas DC2, as set up on Page 40 of the January issue interested me greatly. However, I am glad to have the opportunity to give you first hand information about this little wonder-plane which is still very much unknown here.

I returned from France last July after a stay of seven years, during which time I followed my hobby of flying and all things related to it. Through association with several aviation clubs and model clubs, I had the fortune to meet and develop a great friendship with Henri Mignet, the inventor of the Pou du Ciel.

He is a small man, even for a Frenchman, and very shy and timid. He has been interested in flying ever since he could remember and his experiments have kept him in a state of poverty, paying for failure after failure until, by the "hit and miss method" he finally evolved the design which is on the way to make him a famous man in aviation.

As you no doubt know, the difficult part of learning to fly a standard make of plane is to master the different controls, which are quite complicated, and to remember that—in certain positions—they must be reversed, and one control substituted for another. The instinctive movements must give way to maneuvers conceived beforehand, the penalty for non-observance being the well-known crash.

This is not so in Mignet's plane. There

XUM

is only one control. No rudder-bar, and the stick takes care of every evolution the pilot may wish to perform. I have taken up his model several times with the intention of putting it into a spin, and have done everything possible to upset it, all to no avail.

The little machine righted itself every time and resumed its even keel with no fuss or bother. It is practically the only foolproof conception of a flying machine I have ever seen and I expect to build one at the very first opportunity.

Every "addict" in France who can raise 6,000 francs ($400) is making a Pou du Ciel. In attics, dining rooms, garages, villas and apartments one finds plywood and glue-pot, with the motor impatiently waiting in its crating. There is no help from the Government in all this activity.

As there is no law preventing anyone from flying over a private pasture and keeping away from centers of population, the Pou du Ciel flyers are going on. The danger is to land on a recognized field with a plane that bears no registry. The pilot is then subject to a fine and all kinds of trouble is made for him.

These pilots have banded themselves together under the name of "Reseaux des Amateurs de l'Air (Association of Amateurs of the Air). They have formed local clubs or chapters, bought or rented land which they have transformed into small aviation fields. No "regular" plane is allowed to land on them, and they are giving tit for tat to the "regular" aviation. If they won't let them use the regular fields, then "they" can't use the Reseaux private ports ones.

The membership is nearing the thousand mark now, and as an organization, it is beginning to have weight. One result already obtained is the recognition by the Government of the airworthiness of Mignet's ship.

I could go on to give you a lengthy letter about this subject. If you believe that your readers would be interested, I should be glad to prepare an article for you giving you the entire history of this ship and how it came to be conceived, along with a short biography of M. Mignet.

I believe that such an article would be of interest in view of the fact that I hear that flying regulations here are so tight that many are discouraged to attempt to go ahead, and the great source of progress, the amateur, will gradually be driven to extinction.

We are awaiting his article with interest and trust that it will be forthcoming for the next issue. If the amateurs of this country would bond themselves together as strongly as the amateurs of France, aviation would progress much more rapidly than it is doing at present and we would be leaders instead of trailers in amateur aviation.

* * *

A LETTER full of thrills comes from John A. Dunkle, 1735 Eastham Ave., East Cleveland, Ohio, who specializes in 'chute jumps and who has the ability to write a gripping story. We are sorry to announce that it was impossible to make engravings from the 16-millimeter movie film strip that he sent with his letter, but it could not

(*Concluded on page 225*)

The First Douglas Sleepers Take Wing

Here is the Douglas DST sleeper transport ready for its test flights. Carl A. Cover, vice-president of the Douglas company, took the new ship up for the first time.

IN luxury and completeness of facilities for passenger comfort, the new DST (Douglas Sleeper Transport) far surpasses any plane in present operation in the United States. Its gross weight, 24,000 pounds, is two and a half tons greater than the Douglas DC-2, now operated on most of the major airlines in the world and the largest plane in present domestic operation.

With a wing span of 95-feet, an overall length of 65-feet and an overall height of 16-feet, 4 inches, the new plane towers above any other transport plane ever flown on an airline in this country.

In exterior appearance, the new plane resembles a much larger version of the present Douglas in that it is an all-metal low-wing monoplane powered with two engines mounted in nacelles set in the wing on either side of the fuselage. From the front, however, the width of the fuselage in comparison to its height is much more pronounced and other specications are considerably more generous.

Within the spacious cabin this added room is even more generous. Never before has a plane been designed and built for domestic air line use with the luxurious roominess of the new DST. The cabin is seven feet 8-inches wide and 6-feet, 6-inches high, permitting passenger facilities heretofore impossible.

Eight roomy sections, four on each side of a broad aisle, comprise the interior of the passenger cabin. Each section includes two seats, each 36-inches wide, facing each other. By night the backs and bases of these seats are folded together to form a thick, soft foundation for the mattress for the lower berth. The upper berth and mattress are dropped into position from the ceiling of the section.

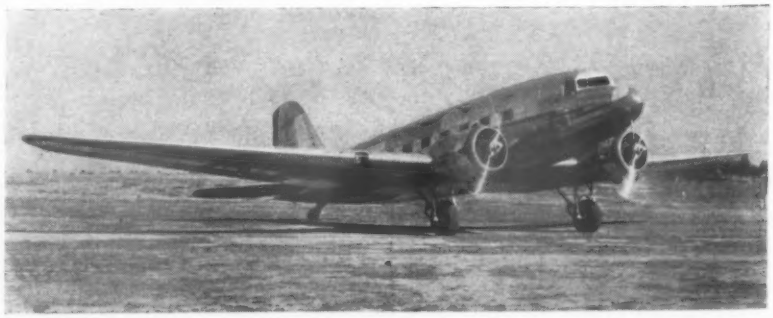
Each berth measures 6-feet, 5-inches in length—several inches longer than the standard rail sleeper berth—and enables even the taller-than-average man to stretch out in complete comfort. Lower berths measure 36-inches in width and the uppers 32-inches.

Bottoms of the lower berths are 6-inches above the floor at night and 8-inches during the day, leaving a convenient space for the storage of small hand luggage. The thick soft springs and mattress add another nine inches to the height, holding the sleeping passenger fourteen inches above the floor of the cabin. The upper berth is 46½-inches above the floor and steps are provided to enable passengers to enter this berth with ease.

Cabin windows serve the lower berth. A smaller window, at the head, serve passengers in the upper. Both berths are complete with reading lights, clothes nets, electric call buttons to summon the stewardess, and baggage racks.

The most complete commissary ever designed for a transport plane is located at the front of the cabin, directly behind the pilot's cockpit. Provisions are in-

(*Concluded on page 217*)



Another view of the Douglas DST, which weighs two and one-half tons more than the previous Douglas DC2 transport. The cabin of the DST is more spacious than formerly and the other dimensions are increased correspondingly.

A Hangar for Only Fifty Bucks

by ROY P. FRY

Amateurs of Americal Here's the dope on an all-metal lightplane coop for a price that is known as "Merely a Nominal Sum." Fifty bucks is not an exorbitant price for sheltering the old jillopy against the elements.

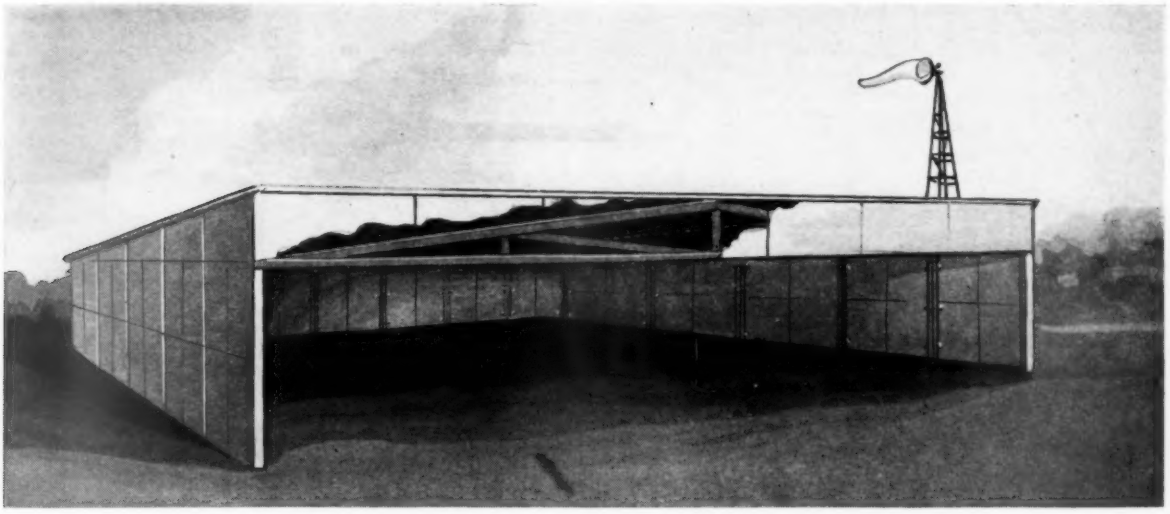


Fig. 1. And here is the hangar complete. Build it for $50 or less. Wind-sock, wind-sock tower and other accessories at a slightly additional cost. Doors? She has none and don't need them.

SINCE you are asking for it here it is, the best hangar in the world for the least cost, or at least I think so.

It all came about like this. Last summer our local field was made unusable for landing purposes and I was forced to use a sand-bar on the river for landing field. Now, as I am not very rich, I found the hangar problem pretty hard to meet. I figured on lumber, sheet metal, concrete, used brick and every other building material, but always the figure was too high.

Upon passing by the city dump, one day, I noticed a lot of old metal spray and oil barrels. An idea popped into my head. Here was a new building material for me to figure on. I measured the barrels and found they would make a panel thirty-two by fifty-four inches on an average, so I went home and drew up an outline for a portable hangar which I could bolt up in sections.

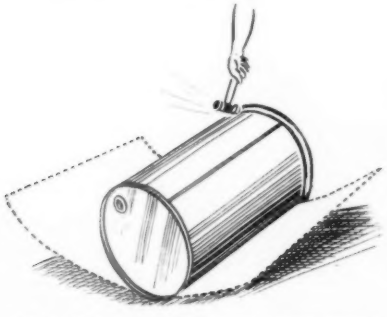


Fig. 2. The metal panels are manufactured from the raw materials by ripping open steel oil barrels and straightening the sheet. Dotted lines indicate the development of the panel.

It proved to be the solution to the problem of hangar cost if I could get the barrels cheap enough. I went back to the dump and told the man in charge what I wanted. He sold me the entire supply of barrels and agreed to save any more that came in until I had enough. The price was Five Dollars, and remember, this is the biggest item of supplies needed for the hangar.

It is this item that makes hangars expensive, for these barrels furnish enough material for sides and ends, and though I did not use it for roof, yet it can be done as well as for sides. Now that you know how it happened we'll take up the construction of the hangar.

In Fig. 1, you have the rough outline of my hangar. The building is in sections which were 5x8½ feet and are bolted together with quarter-inch stove bolts 5 inches long. The hangar is 25x35 feet and is 12 feet high in front and 8½ feet high in back. This will care for the average plane and leave lots of room to work in.

In my case, the front is open but you can put in a door if you can afford track or hinges. You will note the method of trussing the front to support the roof and door as outlined by the dotted lines. The panels are bolted on a 2x4 plate at the bottom and top which extends full width of the ends and back.

The front above the door, is a truss built up in one piece for strength and no regular panel was placed over it, but instead I nailed the metal sheets direct to it after it is in place. Also, the ends above the panels were built the same way. I have the roof of shiplap and cover it with common asphalt building paper, but the roof can be built much cheaper and just as well of the same metal sheeting.

The wind sock and tower are extra, but with close figuring and a few more junk parts you might be able to include it.

Getting back to the first things, in Fig. 2 you will see how to go about making metal sheeting out of discarded barrels. The drawing is so simple that explanation is hardly necessary. I found that the claws of a carpenter's ripping hammer was the best thing for opening the seams. I didn't ask the Union if you can use the hammer without a carpenter's card, but I took my chances and survived to date.

If your barrel doesn't have seams, it

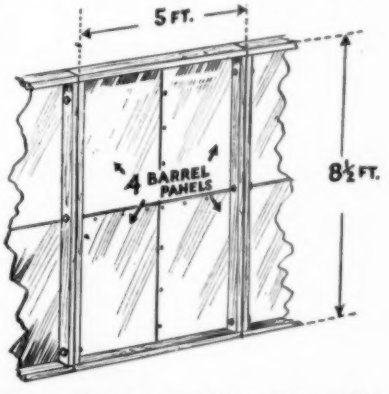


Fig. 3. Here is a complete panel assembly made up of a 2" x 4" frame and the sheet metal from the split oil barrels. The dotted line indicates the four steel sheets comprising the panel.

will be necessary for you to cut the barrel around the ends and up the side. An old axe of good temper is the best thing for that. Once opened up, lay it out on the ground and walk on it a bit to straighten it up, then lay it aside and tackle the next. This sounds like a big job, but it is easier than it looks. You can do the whole bunch for the hangar in two days' time if you have the barrels with the seams.

Fig. 3 shows how I built the frame for each section in the hangar. Just 2x4 nailed into a frame 5x8½ feet in size and four metal barrels make up one panel or section. Nail the four sheets on and give plenty of over-lap on the sheets in the middle of the section. Then rivet, as shown in the drawing by the dots. Cut off nails make very good rivets. The drawing shows how I bolted them. You could use one less bolt on the sides of each section, but it is plenty cheap with them and it is really strong and neat.

With the barrels knocked down, the sections built up and a man to help you, you are ready to set up the hangar. It is useless for me to go into details about this. Use your own head, and remember that bolt holes must match. You can't go wrong if you do this.

If you own the ground, you are building on, you can save a lot of time and money if you just build up a frame of 2x4 and nail the sheets onto it direct. Probably you will want a different size building any way. If you build it in sections and want a different size, leave out or put in sections to suit yourself. Or you can make the sections of different size.

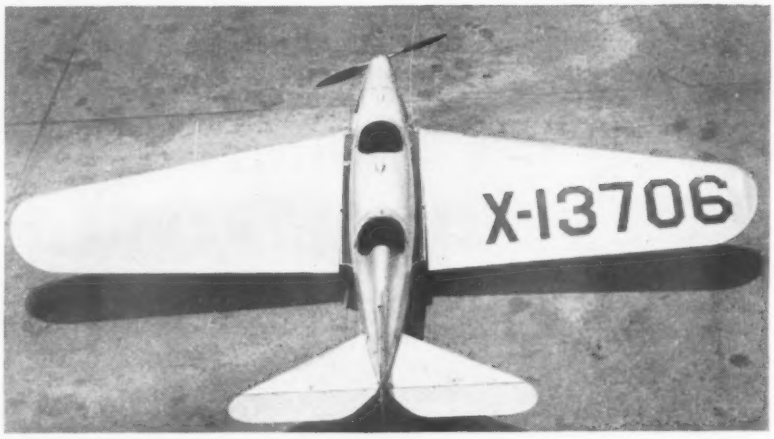
Last, but not least, you will want to paint it. Take a bucket of gasoline and go over the metal sheets with an old rag soaked with the gas. Wash off all the oil and rub off any rust. Then, for a good cheap paint, you can find an orange such as is used on bridges. It also preserves the metal and is right for hangar color because it can be seen further than other colors. A barn red paint will do very well, but can't be seen so far and isn't as long lived on metal.

There it is, a hangar for fifty dollars or less. The cost will vary according to your local supply costs. Here is a detailed price list for items at local prices for here, and as I find I have included too much material in some items, you can save some by figuring close.

Barrels at city dump	$ 5.00
2x4, 1000 ft.	12.00
2x6 for rafters, 1000 ft.	14.00
Ship-lap for roof, 1500 ft.	15.00
Paper for roof, 2 rolls of 500 sq. ft.	2.70
Nails	1.50
Bolts	2.50
Labor (Depends on you)	0.00
Other necessary items for truss, etc.	5.00
Total	$57.70

I should like to hear from any one who completes a hangar from the ideas gained here.

Novel Features of the Cornelius Freewing



Looking down from the rear on the Cornelius Freewing from which point we can see the separation between the wings and fuselage.

THE Cornelius Freewing has been designed and constructed with the definite idea in the mind of the inventor to create a plane that would be convenient, easily handled, and safe; one that could meet the requirements of the novice and yet draw the admiration of those experienced in flying; something that would further instill in the minds of Mr. and Mrs. John K. Public the fact that flying is a necessity and a pleasure of today and not a feat of daring of tomorrow—it was built with their safety in mind.

The plane now being experimented with is a low winged, silver monoplane with a thirty-five foot span, very trim in appearance, and at first sight reminds one of the new Ryan ST, but upon closer examination very striking differences are readily noticed, first of which is, to the experienced eye, the tremendous chord close in to the fuselage and the LACK OF AILERONS. The wing is floating "free" from the fuselage, being supported by two interior braces located exactly at the center of lift, and a flying wire that attaches itself to the wing where their motion is the least to avoid variable tautness. The interior braces move with the stick, giving a variable angle of incidence, creating the lateral motion of the plane while in the air, hence doing away with the ailerons, and by so doing leaving more square footage of wing surface for lift. The question "Will wings of this type stay with the ship under excessive pressure, as is exerted in a power dive?" Mr. Cornelius' answer to that query is this, "More strength has been obtained in this free wing than in any other airplane per pound of weight. Another advantageous feature is the fact that there is no tortional strain on the wings."

The principal has successfully gone through over 2,500 hours of strenuous tests, and has carried approximately 6,000 passengers. Its actions in the air are more nearly comparable to the gliding, soaring bird, than ever before obtained in anything, with the possible exception of the sailplane. The landings are easy and practically perfect under conditions that would probably mean a serious crack-up in any other model. Landings have been made repeatedly with the wheel brakes locked and the tail down, or on the ground. Turns and banks are entirely "automatically perfect," being made with either the stick or rudder alone. To demonstrate and prove these facts, the designer, while in Los Angeles, took off, flew to a desirable height, handed the only stick aboard to the passenger in the front pit who immediately leaped overboard with the said stick. Then with only rudder and throttle a safe and apparently easy landing was made. The creation absolutely will not spin; it takes the controls away from the pilot and automatically rights itself in the stall. To throw the ship into a spin, enough pressure would be necessary on the controls to break the stick. This measures approximately two hundred pounds.

These facts all go to prove the inventor and designer's statement that "Stability characteristics have been achieved that never before have been obtained in any other design."

These results are brought about by the automatic cooperation of the different members of the tail group with the wing. The stabilizer moves as readily as the elevator at the will of the pilot, helping to stabilize the ship. It absolutely will not slip or skid voluntarily. It must be forced. This test plane lands at 40 to 45 miles per hour, approximately the speed at which the new model will "set down."

Concerning the finished product, which the designer hopes to have in active production in the spring, it is to be an all-metal job with every convenience of a modern automobile. It will be built in the $1,500 class and will be a cabin type

(*Concluded on page 208*)

A Visit With Henri Mignet

by JOAN THOMAS

Our Paris correspondent, Miss Thomas, made a visit to the home of Henri Mignet, at present the most famous man in French aviation. If you don't recognize the name, Henri Mignet is the father of the Flying Flea or Sky Louse, whichever endearing title you may prefer.

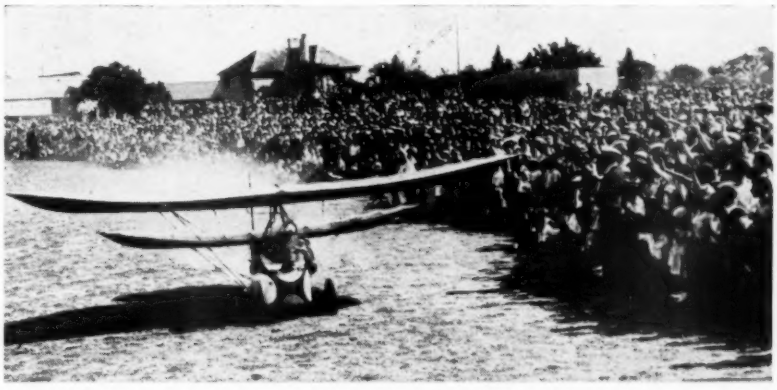
WE had been told that Henri Mignet, the inventor of the famous "Pou-du-Ciel" did *not* like journalists and usually refused to see them, but that we might be able to interview Madame Mignet, who has always been closely associated with her husband in his work. And since I am primarily interested in women's activities, that seemed a good suggestion.

Just before Christmas, a friend who is a Pou-du-Ciel enthusiast, offered to drive us out to Meaux where the Mignets live. It was a glorious day . . . one of the few we have had all winter . . . so that the trip out through the Bois de Vincennes and the valley of the Marne would have been worth while, even though we had failed to get the interviews.

However, we were fortunate enough to find Madame Mignet at home, and later we drove out to the airport and had the rare opportunity of watching M. Mignet himself, making flight-tests on a new model of the Pou.

Madame Mignet's command of English is about on a par with our knowledge of the French language, consequently the interview was an amusing mixture. However, with the help of our more versatile interpreter, we were able to get a vivid picture of the long years of patient effort, the repeated trials and untiring search for the best type of small easy-to-build, easy-to-fly airplane. Mignet spent ten years building and rebuilding lightplanes, with the usual type of ailerons and foot-controlled rudder, before he conceived the new idea of a "movable wing."

The "H-M8," which he perfected in 1927-28, was an excellent little machine and there were over two hundred of these built according to instructions given in his first book. A number of these ships are still being used today. However, Mignet was not satisfied with the performance of the "H-M8." It was just another airplane built along the lines of accepted theories. He did not believe it was simple enough in construction, nor that it offered the maximum safety for the amateur flyers.



Henri Mignet and the Flying Flea on their arrival in England, created a vast interest and drew huge crowds to the English airports. This is the Flea that flew the English Channel.

When he began to work on the idea of a "movable wing," the idea was so revolutionary, he knew that he could not get permission, or at least that it would take months or possibly years of waiting to secure a permit to carry on his experiments on an established airport. Therefore, he rented a secluded field and for three years (1931-1934) he camped on the spot, living in a tent and working completely alone, except for the help and encouragement of his plucky little wife.

A Flea huddling up under an L. A. P. E. Douglas shows the great range of size possible.

Madame Mignet smiled, when we asked if she had helped in the construction of the new ship. She said, "I did sew the fabric! And though I am not an engineer, it is a great assistance for my husband to have someone with whom he can discuss his ideas. Just talking it over, helps him to formulate his theories.

"I could not stay with him all of the time, because I have two children and a house to manage, but I went out there as often as I could and one time stayed five months. It was very interesting living in the tent and watching the development of the ship."

When Mignet wrote his second book, giving the history of his efforts and explicit directions for the building of the new plane, the response was instantaneous and amazing. The first edition of 6,000 copies was completely sold out within a few weeks. An English edition (of the same number) was exhausted in 14 days and during the past year over 500 machines have been or are in the process of being built in France alone.

The number of people who wish to interview M. Mignet or consult with him about the construction of a plane, beside the ever-growing correspondence, would seem to be a task for a staff of secretaries. However, it is Madame Mignet who takes care of all the business and handles the prodigious amount of correspondence connected with the work. Her blue eyes twinkled as she said, "For my husband . . . how do you say? . . . my husband has no head for business. He thinks only of his plane!"

The immense popularity of the idea may be judged by the fact that Mignet's book, "Le Sport de l'Air" is being translated into ten different languages, besides the English and French editions. When we asked Madame Mignet if she had collaborated with her husband in writing the book, she laughed. "Not exactly,"

XUM

she said, "but after he had written a chapter he read it to me, and if I did not understand exactly what he meant, then he knew it was not good and he must write it again."

Small in stature, with brown bobbed-hair, keen intelligent eyes and a friendly smile; Madame Mignet is certainly one of the most attractive Frenchwomen we have ever met. And during the long and animated discussion of the "Pou-du-Ciel," we kept thinking of the tribute Sisley Huddleston pays to the women of France. He writes:

"Everybody who has lived long in France must have been impressed with the efficiency of the French woman. Devoted as she is to the home, regarding the family as the basis of national life, practising the most careful management, unsparing in her labors, she is yet not narrowly confined to the household.

"Never does she allow herself to be regarded as a creature of leisure and luxury. She has not demanded the vote because she is aware that by her activity and intelligence she has obtained for herself a much more important position than the vote or any formal recognition of an improved legal status would confer upon her."

"No, I don't fly," Madame Mignet said, smiling at our question, and by that simple statement proving herself the true Frenchwoman! One who is proud of her husband and his work, taking an active part in it, yet content to remain completely in the background.

* * *

MIGNET himself, struck the keynote of the new movement several years ago, when he said, "The Ford is the flea of the road. Why shouldn't we have a flea of the skies?" Thus when his new plane was announced it was promptly dubbed the "Pou du Ciel" or "The Flying Flea."

An excellent description of the "Pou du Ciel" and the principles involved in the movable wing, was given in an article published in POPULAR AVIATION last August. Therefore we will not go into the details of its construction here, but try to see why the "movement" has created such a wide-spread interest, and how far it justifies the claims of its inventor and his followers.

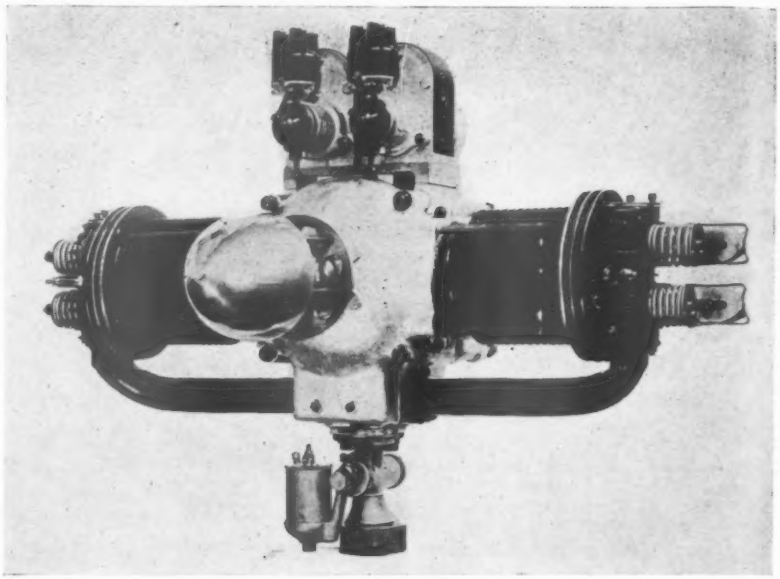
Beside the striking originality of the idea, the personality of M. Mignet, who is both friendly and intelligent, has been responsible for much of the enthusiasm. His sincerity and clear logical reasoning command respect from all who know him, whether or not they believe his idea may be practical.

Critics and admirers alike, give Mignet the credit for the great wave of renewed interest in aviation. And the French Government has shown its appreciation by awarding him the red ribbon of the Legion of Honor. In the U. S. A. he probably would have been awarded a $500 fine for his efforts.

It is good propaganda to say that Mignet is not a pilot nor an engineer.

(*Concluded on page 224*)

The Poinsard 25 H.P. Lightplane Engine



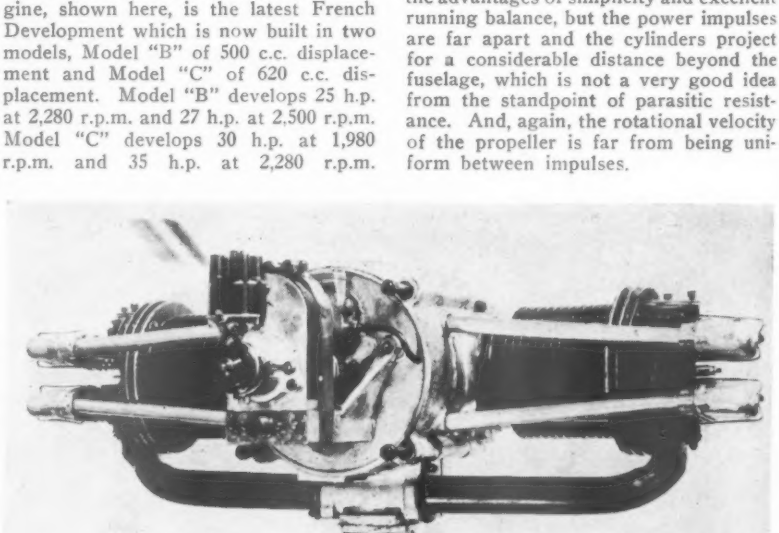
Propeller end of the Poinsard 25 h.p. engine, a 2-cylinder, 2-magneto opposed type air-cooler. This engine is the outgrowth of the "Flying Flea" mania.

WHATEVER else may be said or thought about the "Flying Flea," it certainly has been the basis for a whole lot of lightplane engine activity in France and England. Further, it has been instrumental in dragging out the opposed type 4-cycle engine and numerous 2-stroke cycle engines.

The Poinsard 25 h.p. lightplane engine, shown here, is the latest French Development which is now built in two models, Model "B" of 500 c.c. displacement and Model "C" of 620 c.c. displacement. Model "B" develops 25 h.p. at 2,280 r.p.m. and 27 h.p. at 2,500 r.p.m. Model "C" develops 30 h.p. at 1,980 r.p.m. and 35 h.p. at 2,280 r.p.m. The maximum horsepower of the latter model is 38 h.p. at 2,500 r.p.m.

It is said that French engine manufacturers have produced a total of well over 1,000 engines for lightplane service in 1935 which is far more than in the U. S. A. where automobile engine conversions are the most prominent.

Two-cylinder opposed engines have the advantages of simplicity and excellent running balance, but the power impulses are far apart and the cylinders project for a considerable distance beyond the fuselage, which is not a very good idea from the standpoint of parasitic resistance. And, again, the rotational velocity of the propeller is far from being uniform between impulses.



Cockpit end of the Poinsard engine with a single magneto installation direct driven from the end of the crankcase.

What Our Readers Are Building

Our readers have developed, designed and built a great number of lightplanes, gliders and engines which are of great interest to all aviation fans. We extend a welcome to all lightplane builders and ask them to submit descriptions and photographs of their productions.

THIS issue will be devoted entirely to the lightplanes of the Private Flyers' Association of Oregon of which we have spoken many times. And by this, we do not mean that we are showing all of the planes belonging to this association—not by a jugful. We are indebted to Elmer L. Smith for the accompanying photographs and will introduce Mr. Smith to you as being the secretary and treasurer of the association.

First on the picture line-up is the Salmson powered biplane belonging to Mr. Elmer L. Smith, a plane that has been evolved and improved from the original Smith plane shown some years ago in this column. Taking it all, from nose to tail, it is one of the nicest looking little ships that we have seen, with wonderfully clean lines and above all—a biplane.

This ship holds the present P.F.A. amateur record for altitude, 11,500 feet in 40 minutes, and Mr. Smith says that this is not her ceiling by any means. The top speed in horizontal flight is 95 m.p.h. And we'll add a word more by stating that this is one of the nicest decorative schemes that we have seen thus far on an amateur ship.

Second is the Henderson powered parasol belonging to Alfred and Stanley Fox, Springfield, Ore. This is the second ship that these boys have built and has seen 170 hours of service up to the time that we received the letter from Mr. Smith. They recently sold this ship and are now working on another of the same type but arranged as a two-seater. The plane shown has a top speed of 65 m.p.h. and lands at about 25 m.p.h., which for the power installed, is not bad at all.

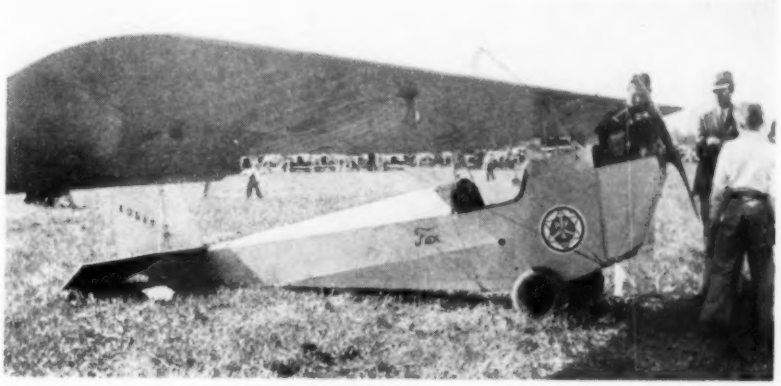
Third is a photograph of Yale Smith's Anzani powered monoplane, a high-wing type of exceptionally neat design. This plane was also shown in its early stages several years ago in POPULAR AVIATION. Nothing is said concerning its dimensions or performance so we'll have to let that go until a later date.

It is certainly consoling to see these little ships out in the middle of the airport with only their identification numbers in evidence and without interference by the state authorities. There are a whole lot of boys in a whole lot of states that would be glad to have this liberty. Another state which should be put on the honor roll is Virginia, where the state does not interfere with amateur activities. One of our readers just gave us this information and asked us to send an invitation to the bunch to visit Virginia when it got to be too hot for enjoyment in any of the other states.

Some Outstanding Examples of Lightplanes

This is the fine little ship belonging to Elmer L. Smith, Eugene, Ore. Note the emblem or insignia of the Private Flyers' Association of Oregon will be seen on the vertical fin. It is powered with a Salmson engine.

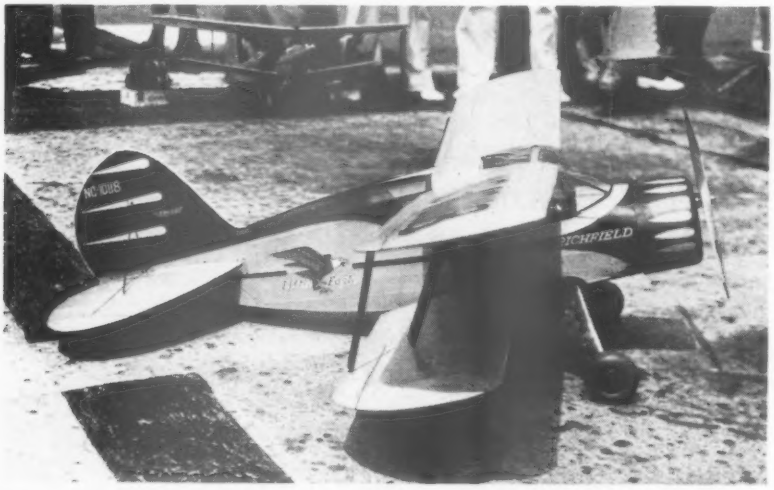
And now we see the well designed top wing monoplane, Anzani powered, belonging to Yale E. Smith of Eugene, Oregon. A neat little job and a good performer.



This is the "Fox TP," a Henderson powered monoplane belonging to Alfred and Stanley Fox, Springfield, Oregon. The P.F.O. insignia is also emblazoned on this nifty little rig.

An Array of Gas-Power Models

Here Are Some Fine Examples of Workmanship



Maurice W. Collins' Waco "C" cabin type gas-power model is a wonderfully well put up job and an exact miniature reproduction of the original Waco.

This is the fine looking gas-model built by Dr. J. P. Young of Sacramento, Calif. He has had a lot of pleasure and excitement with this model and is enthusiastic over the game.

This model, built by George H. Warden, in 1934, looks like a young airplane in every respect. If it were not for the scale effect of the buildings in the background, it would be mistaken for a lightplane.

WE are most certainly getting a fine collection of gas-power models for this department. They are coming in from every section of the country and of all types and kinds, every one of which should be an inspiration to intending builders.

First of all, we lead off with a most beautiful model of a Waco Model "C" cabin plane which is most complete in every detail. This picture, taken at the Glendale Municipal Airport, Glendale, Calif., shows the handiwork of Maurice W. Collins who has been building models since 1914. Mr. Collins is an instructor in flying for several of the military academies in the vicinity of Los Angeles.

The model weighs six pounds and has a cruising speed of 35 m.p.h., with a gas supply for 10 minutes flying. The covering is Japanese silk of the quality used by the Irvin Air Chute Company in manufacturing flare 'chutes. This silk is much lighter and has a much finer texture than that employed for large parachutes. It is powered with a 1/5-h.p. Brown, Jr., engine that has a normal speed of 6,000 r.p.m.

Aluminum tubing, ⅛-inch in diameter, is used for outlining the wing-tips, tail and rudder while a worm-gear adjustment is provided for the adjustable stabilizer. An Eastman Kodak cut-out is used for the control of the flight time and a hatch over the cockpit gives ready access to the motor controls.

It is fitted out to the smallest detail with the cabin upholstered in blue corduroy, and a mahogany dashboard with a full set of dummy instruments thereon. It is finished in blue and yellow, the color of the planes belonging to the Richfield Oil Company.

Next comes another Californian, Dr. J. P. Young, Sacramento County Hospital, Sacramento, Calif. His fine little model has a span of 7 feet and weighs 4½ pounds ready for flight. In the construction, balsa was used for the wings and tail-group while both balsa and spruce are used for the fuselage. Silk is employed for the covering. Rubber balloon wheels for the landing gear and a complete cowling for the engine are features of this design.

He has had several remarkable flights, with moving pictures taken of the flights. It takes off within 20 to 25 feet, climbs rapidly and glides to a landing on an even keel after the gas supply is exhausted. The flying speed is in the neighborhood of 30 m.p.h. Dr. Young says that he has had many pleasurable hours with this model and many exciting moments, and we'll bet he has had both of 'em. Thanks.

George H. Warden, Hughesville, Pa., is the next to receive our congratulations for his model built in 1934. This most certainly looks like a young air-

That Have Proved Themselves

Bill Owens, member of the Central Gas Model Society, with his gas powered Bellanca, "Miss Columbia." It has a span of 7 feet and a chord of 12½ inches.

plane or airplane cub, it is so truly to scale. We are sorry that no more data was included.

Next comes a model that not only performs well but has a historical background as well. Victor Krueger, 2007 N. 39th Street, Milwaukee, Wis., sends us a picture of his gas-model plane which he claims to be the first to fly in Milwaukee. It has made 21 successful flights, up to the date of Mr. Krueger's letter. Its best flight has been 5 minutes, 48 seconds, and on that flight, the motor ran for 2 minutes while the glide continued for 3 minutes, 48 seconds. This flight was made on one-quarter ounce of gas.

Bill Owens, Chicago, Ill., a member of the Central Gas Model Society, built this fine Bellanca "Columbia" which has a span of 7 feet and a chord of 12½ inches. We'll print some more dope on this ship as soon as we get it.

And now comes a big one, so big that we wonder if it don't come under the lightplane class. The wing span is 12 feet or nearly as great as that of a "Flying Flea." It was built by Leslie M. Adams, Moultrie, Ga., and it has a record of 40 minutes, 42 seconds on one ounce of fuel. We are sorry that no more information nor a suitable picture came in.

Dan Calkins, 3055 N. E. Everett, Portland, Ore., has gone to the other extreme and has built, what he believes to be, the smallest gas powered model ever built. It has a wing span of 35 inches and weighs 13 ounces when ready to fly and with the power plant included. It had made 28 flights up to the date of the letter and has proved to be a very fast climber.

While Mr. Calkins does not state this fact in his letter, we infer that he also built the engine because we do not know of any standard engine that has a jet carburetor, an enclosed automobile type timer or three cast iron piston rings on the piston. The displacement is 0.125 cubic inch.

(*Concluded on page* 210)

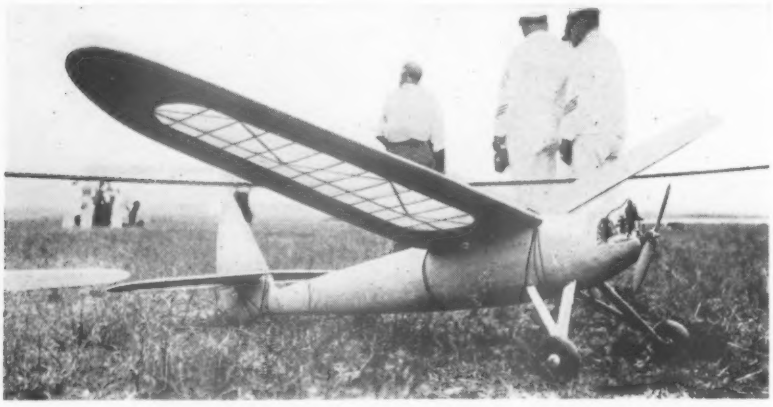
Victor Krueger sends this photo of his model just taking off.

Dan Calkins is trying to build them smaller instead of larger.

"SOVFOTO"

And this is the way that they do it in Russia. They look very serious, but perhaps it is not as bad as all that. This model was built by N. N. Kazik of the Leningrad Air Club.

The Cavalier and Buccaneer Are Striking Models



The "Cavalier" is a well performing gas-power model designed by Ben Shereshaw and built by Ortie Stevens. It has flown 20 minutes on ¼ ounce of gas and has a top speed of 32 m.p.h.

"THE Cavalier" is a streamline high-performance gas model designed by Ben Shereshaw, Irvington, N. J., and built by Ortie Stevens of Newark. The ship first made its appearance at Lakehurst, N. J., where it made a flight of over 20 minutes on approximately ¼-ounce of gas.

The ship has a wing span of 9 feet and weighs less than four pounds without the engine. An Eiffel 400 section is used. The wing is of a lightweight cantilever construction which is extremely strong.

The fuselage is of a monocoque construction, built up of balsa planking. The tail unit and wing is mounted with rubber bands and are removable for shipping.

The ship is extremely sensitive to thermal currents and has a twenty-one to one glide in still air. Using a one-fifth horsepower motor, the ship has a top speed of thirty-two miles per hour and landed at approximately sixteen miles per hour. Although the ship has hit tents, trees and hangars, there has been no structural damage to date.

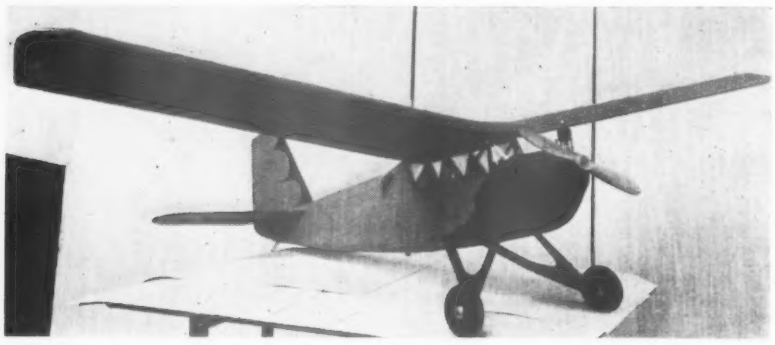
"The Buccaneer" is a conventional cabin gas model of pleasing lines and with unusual flyability. Ships of this design have made over one hundred successful flights to date averaging about five minutes each.

Upon inspection it resembles the Rearwin Sportster, however, the ship is of original design, having been developed through five previous models. The wing span is seven feet four inches and the ship weighs 4¾ pounds, complete with motor. The ship has a top speed of 28 m.p.h. and lands at 13 m.p.h. Low landing speed is maintained by using an Eiffel-431 wing section, which gives a cushioning effect when the ship is landing.

The wings and tail unit are cantilever. The body is built up, the longerons being spruce and the bulkheads and fairing of balsa. The ship pictured was designed and built by Bill Effinger of Brooklyn.

From the general appearance of the "Cavalier," it would seem that the round tapering fuselage would present the least possible resistance because of its round section. It is the little refinements of this sort that increase the general performance of he ship and enable it to present new records. Further improvement would probably call for fillets between the wing and the body.

The designer and builder are to be complimented upon the design.



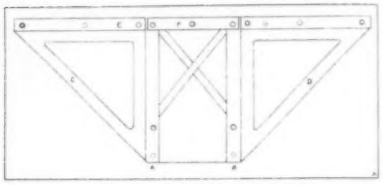
Here is the "Buccaneer", a cabin type gas-model much resembling the Rearwin Sportster, although of original design. It has a top speed of 28 m.p.h. and lands at 13 m.p.h.

Gas Model Kinks

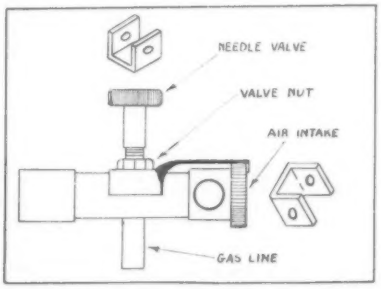
by P. J. SWEENEY

THERE ARE two small but important details that have been troubling gas model builders for a long time and for which I believe can be solved to the satisfaction of everyone.

First, is the difficulty in constructing a suitable motor mount that is at one time, strong, rigid, light and easy to build. My solution of the problem is the sheet dural mounting shown in its "developed" or "flattened out" form below. After folding the cut out sheet along the fold lines indicated, I have found it to be amply strong for all requirements. The dimensions, of course, depend upon the size and type of ship on which it is to be used. It is superior to the tube constructions used in previous models and, as it is all in one piece, there is nothing to get loose or collapse.



Developed view of the sheet-metal motor mount which shows exceptional rigidity and strength.



Method of preventing needle valve from jarring out of adjustment during flight.

Problem No. 2, applies to those annoying moments when the motor conks out and quits suddenly without previous warning or apparent reason. In some cases, this may be due to lose electrical connections or a stuck vibrator on the spark coil.

But, loose connections are not the only reason for a motor stopping dead in its tracks. The trouble may, and frequently does, lie in the mixing-valve or carbureter adjustments working loose under the vibration of the engine.

If the needle-valve should be vibrated to such an extent that the needle valve jars open or closed past the critical points, the motor will stop promptly for these midget motors are very sensitive and critical to mixture adjustments. I have shown here, a means for safetying the gasoline and air-lines by a spring-finger and a lock-nut for the valve.

Building the Navy Type SBU-1

by

PAUL W. LINDBERG
Model Editor and Designer
for POPULAR AVIATION

Here is the model of the SBU-1, a realistic model that is a fine flyer. Check it up with the front cover for accuracy and appearance.

WE KNOW you will agree with us in building this Navy shipboard fighter, developed by our laboratory, that it is a very good lesson in the construction of Navy ships. The Vought SBU-1 is outstanding in appearance and an excellent flyer as well. A great amount of detail has been worked into the model, such as movable controls, shock absorbing landing gear and many other interesting features.

COLOR SCHEME

Fuselage—Gray and Silver.
Tail assembly—Lemon yellow.
Top wing, topside—International yellow.
Top wing, bottom side—Silver.
Bottom wing—Silver.
For other coloring, refer to plan.

CONSTRUCTION OF FUSELAGE

It is necessary to place a sheet of ordinary wax paper over the plan to prevent cement from sticking to the plan. In building the fuselage, construct one side at a time. The longerons, vertical and diagonal braces, etc., are held in place until securely cemented, by inserting straight pins on either side of strips.

After the two fuselage sides are completed, they are pinned to top view of the plan, in such a manner, that the top longerons face down and the sides are at right angles with the table. The crossmembers are now cemented in place, forming a rectangular fuselage.

Cut formers from 1/32-inch sheet balsa and cement in their respective positions. See plan.

Balsa nose plate is built up from ⅛ inch sheet balsa.

CONSTRUCTION OF MOTOR

Cylinders are carved and sanded from balsa blocks. Fourteen blocks required. To represent fins, wind heavy thread around finished block. Make crankcase as shown on plan.

Rocker arm housings, push rods and other small details of motor are made of balsa.

CONSTRUCTION OF WINGS

Cut all ribs from 1/16-inch balsa. Pin the spar in position on the plan. Now cement ribs in their proper locations. The leading and trailing edges are cut and sanded to shape and cemented to the ribs. The panels carry movable ailerons which are a great help controlling the flights. Make wing tips from 1/16-inch thick balsa. We highly approve of this type of wing tip, because it is much easier to construct and neater in appearance.

CONSTRUCTION OF ELEVATOR AND RUDDER

These are built from 1/16-inch square and flat balsa and all constructed on the plan. The construction is very simple, therefore, no difficulty should be encountered.

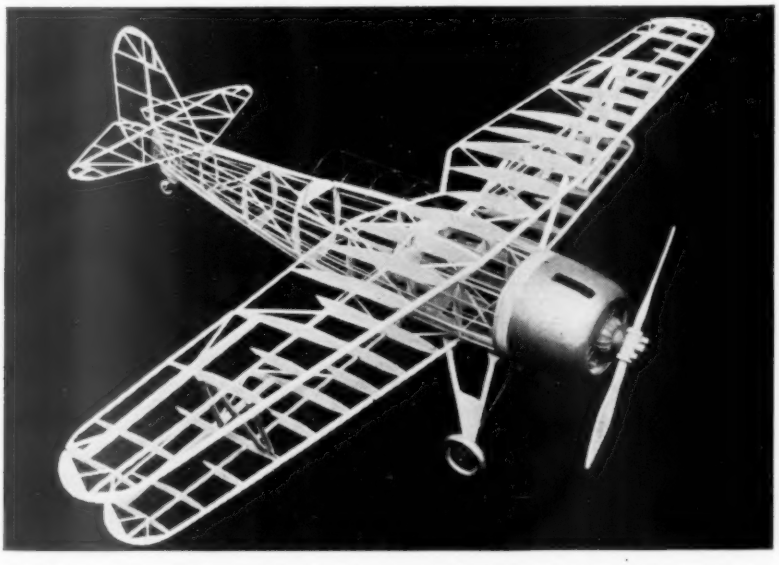
CONSTRUCTION OF LANDING GEAR

After the struts have been carved and sanded, cement them to the balsa disks which cover the inner sides of wheels. The tops of struts carry bushings (cement securely) which receive wire shafts that are fastened to front nose plate and wing fillet. The shock absorbing wire between struts is fitted into curved piece of balsa under front part of fuselage. See plan.

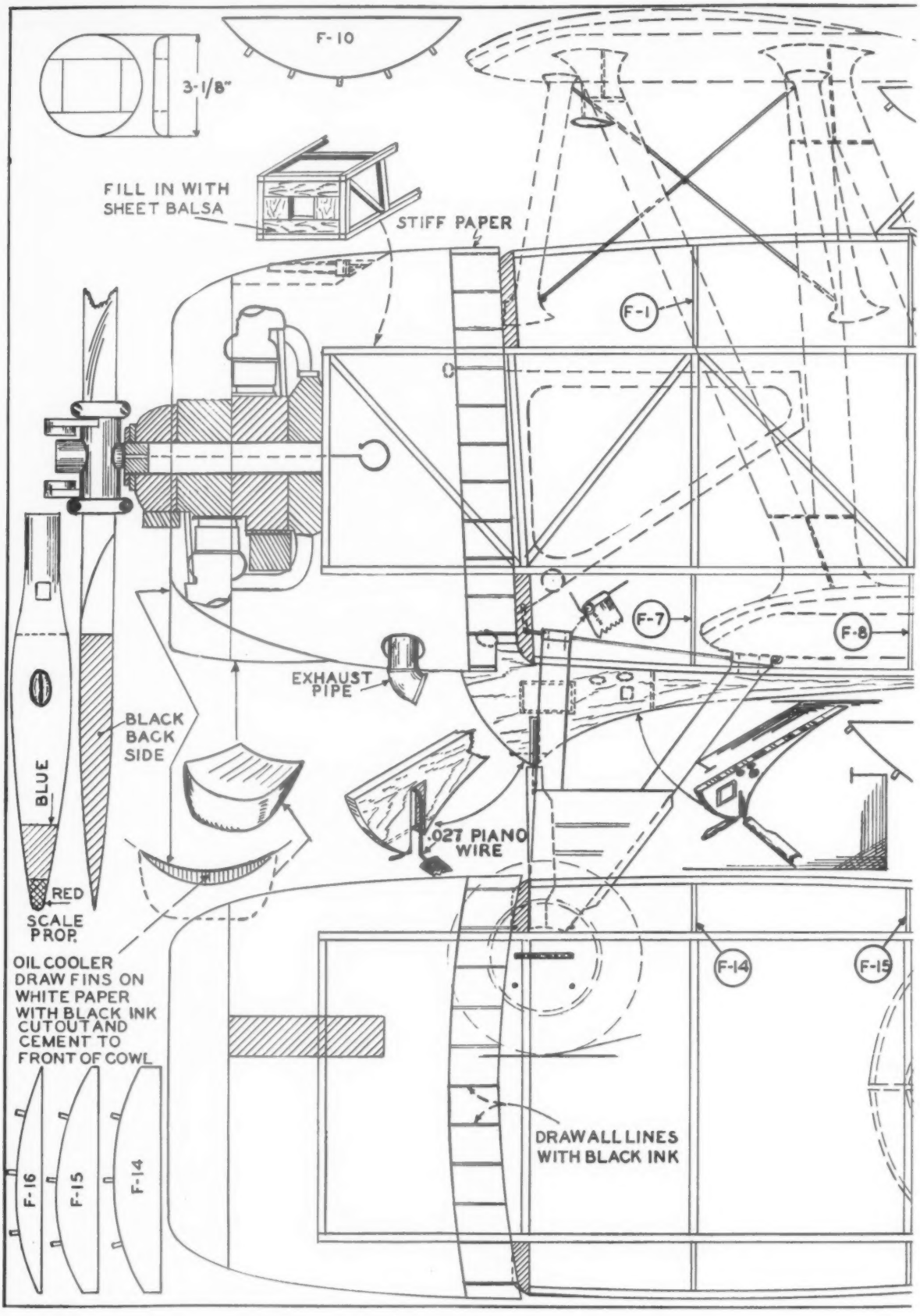
COVERING THE MODEL

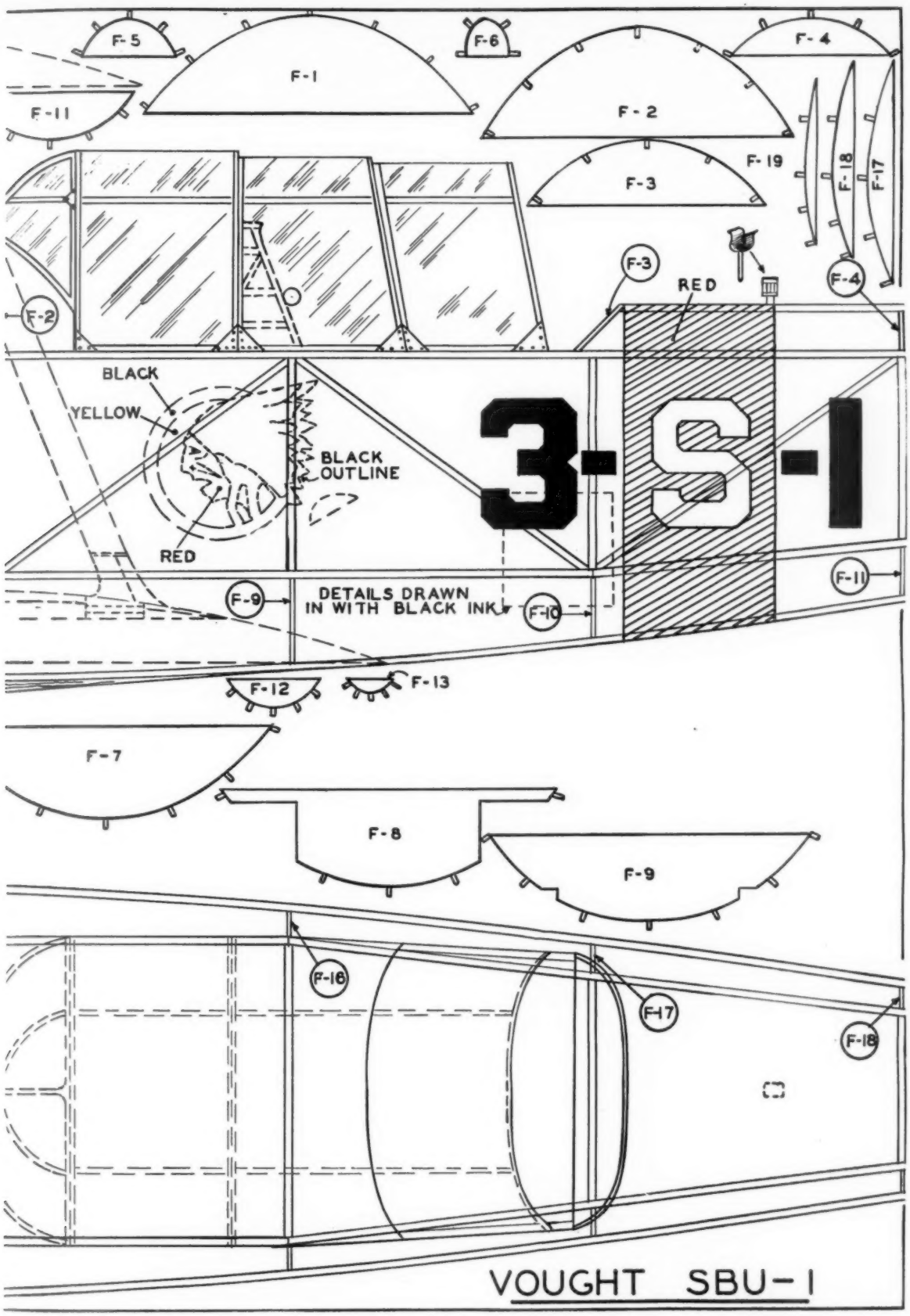
Apply tissue to the various framework

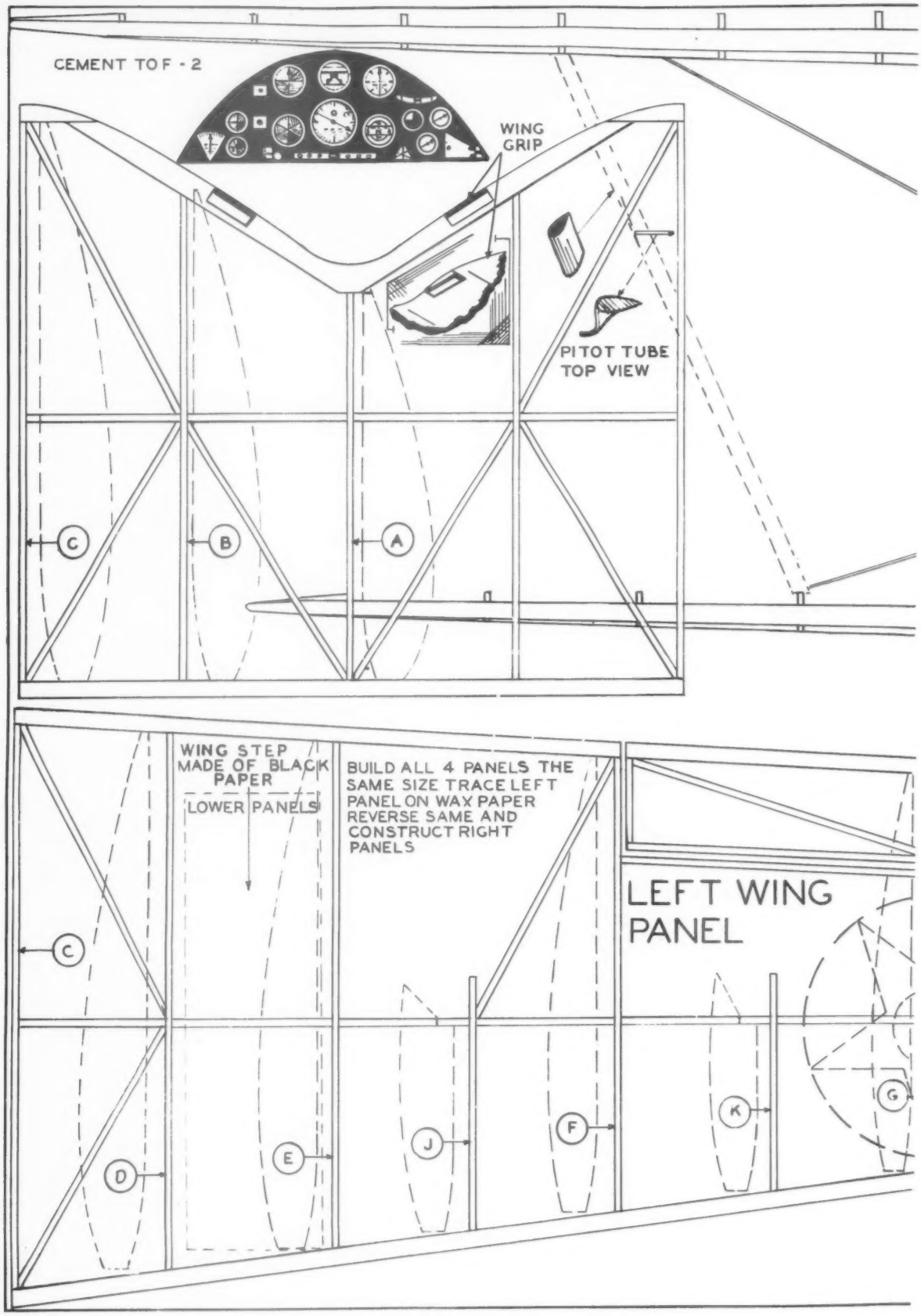
(*Concluded on page* 204)

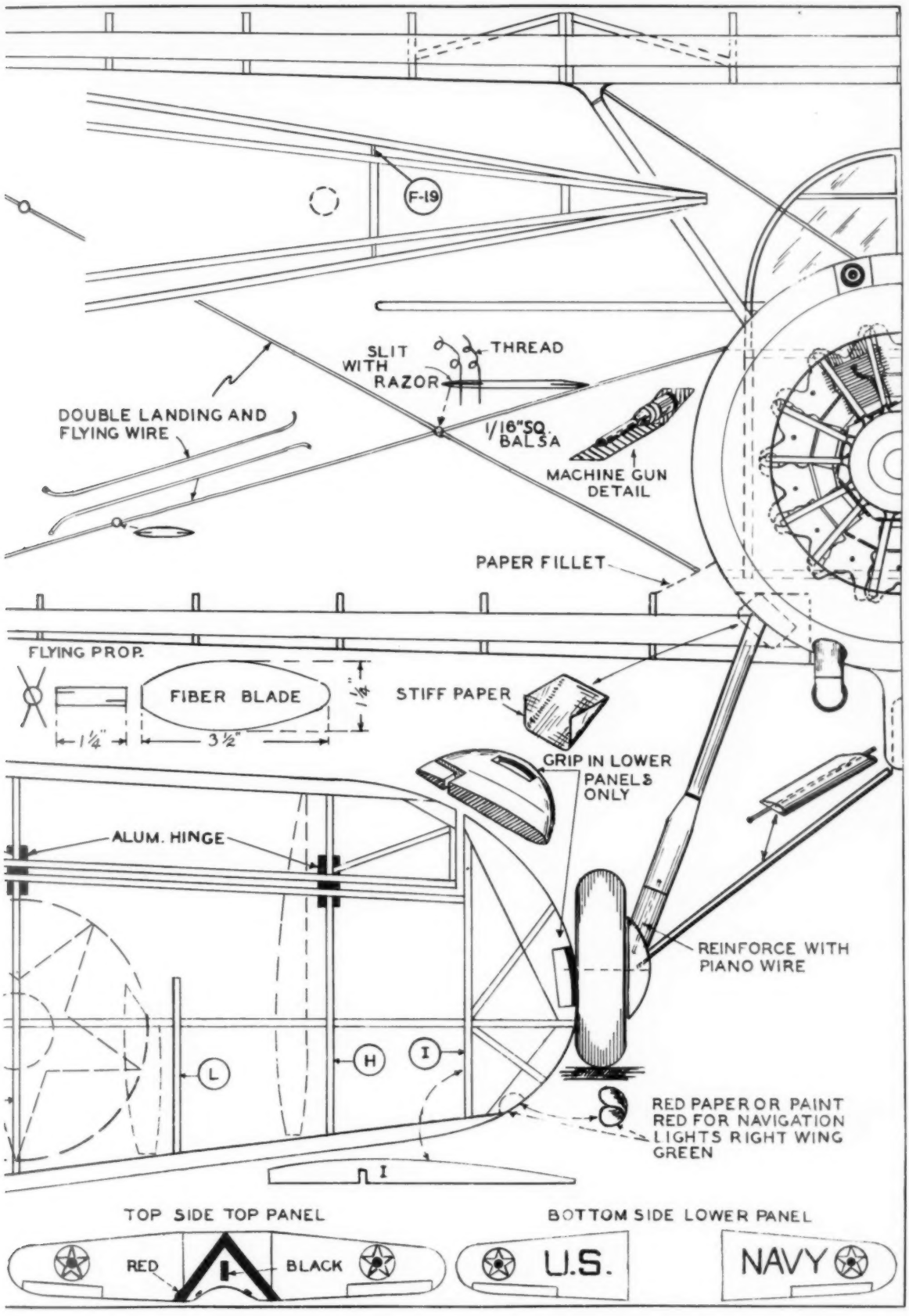


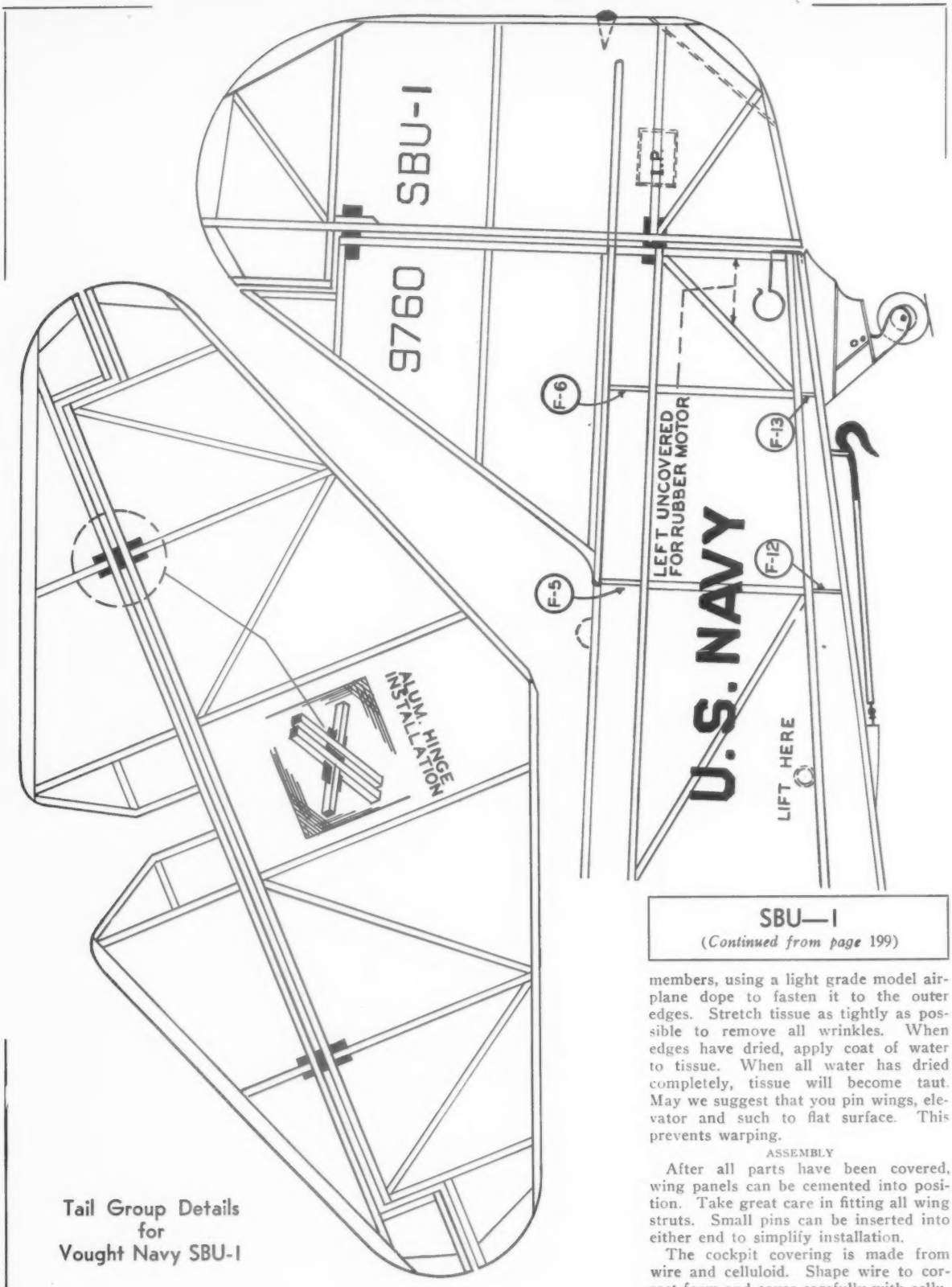
This is the Navy SBU-1 model with the frame-work completed before covering. This will assist in understanding the accompanying drawings.


F-10
3-1/8"
FILL IN WITH SHEET BALSA
STIFF PAPER
F-1
F-7
F-8
EXHAUST PIPE
BLACK BACK SIDE
BLUE
RED
SCALE PROP.
.027 PIANO WIRE
OIL COOLER DRAW FINS ON WHITE PAPER WITH BLACK INK CUTOUT AND CEMENT TO FRONT OF COWL
F-16
F-15
F-14
F-14
F-15
DRAW ALL LINES WITH BLACK INK


F-5
F-1
F-6
F-4
F-11
F-2
F-19
F-3
F-18
F-17
F-3
RED
F-4
F-2
BLACK
YELLOW
BLACK
OUTLINE
3-S-1
RED
F-9
DETAILS DRAWN
IN WITH BLACK INK
F-10
F-11
F-12
F-13
F-7
F-8
F-9
F-16
F-17
F-18
VOUGHT SBU-1


CEMENT TO F - 2
WING GRIP
PITOT TUBE TOP VIEW
C
B
A
WING STEP MADE OF BLACK PAPER
LOWER PANELS
BUILD ALL 4 PANELS THE SAME SIZE TRACE LEFT PANEL ON WAX PAPER REVERSE SAME AND CONSTRUCT RIGHT PANELS
LEFT WING PANEL
C
D
E
J
F
K
G


F-19
SLIT WITH RAZOR
THREAD
DOUBLE LANDING AND FLYING WIRE
1/16"SQ. BALSA
MACHINE GUN DETAIL
PAPER FILLET
FLYING PROP.
FIBER BLADE
1¼"
3½"
STIFF PAPER
GRIP IN LOWER PANELS ONLY
ALUM. HINGE
REINFORCE WITH PIANO WIRE
L
H
I
I
RED PAPER OR PAINT RED FOR NAVIGATION LIGHTS RIGHT WING GREEN
TOP SIDE TOP PANEL
RED
BLACK
BOTTOM SIDE LOWER PANEL
U.S.
NAVY



Tail Group Details
for
Vought Navy SBU-1

SBU—1

(*Continued from page* 199)

members, using a light grade model airplane dope to fasten it to the outer edges. Stretch tissue as tightly as possible to remove all wrinkles. When edges have dried, apply coat of water to tissue. When all water has dried completely, tissue will become taut. May we suggest that you pin wings, elevator and such to flat surface. This prevents warping.

ASSEMBLY

After all parts have been covered, wing panels can be cemented into position. Take great care in fitting all wing struts. Small pins can be inserted into either end to simplify installation.

The cockpit covering is made from wire and celluloid. Shape wire to correct form and cover carefully with celluloid. All other details and markings can be drawn with pen and ink.

END.

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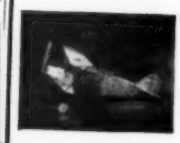
5 ft. Monocoupe



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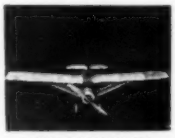
Aeronca
Fokker D-8
Nieuport
Douglas Mailplane
Stinson "R"
Curtiss JN4
Bellanca
Spad
Jap Kawasaki
Russian Fighter

24" CURTISS ROBIN, 25c

24" CURTISS JN4, 25c



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24" NIEUPORT 25c

24" PUSS MOTH, 25c

24" FOKKER D-7, 25c

24" Douglas Mailplane, 25c

24" MONOCOUPE, 25c

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- ☐ Bellanca
- ☐ Nieuport
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- ☐ Stinson "R"
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- ☐ Fokker D-7
- ☐ Fokker D-8
- ☐ Polish Fighter
- ☐ Monocoupe
- ☐ Falcon
- ☐ Aeromarine
- ☐ S. E. 5
- ☐ Sopwith Camel
- ☐ Spad
- ☐ Jap Kawasaki
- ☐ Russian Fighter
- ☐ Aeronca
- ☐ Fairchild
- ☐ Army Hawk
- ☐ Curtiss Robin

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- ☐ Curtiss A8 Attack
- ☐ Northrop Gamma "Skychief"

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City ..... State.....

Major Woeltjen

(*Continued from page* 172)

is also well versed in aeronautical, electrical and mechanical engineering.

Building model airplanes since about 1906, while still in High School, the Major, together with his younger brother Fred, designed and started building his first airplane. Due to his work in school and also lack of finance, the work on this plane was naturally comparatively slow.

The lack of the proper motor gave him additional trouble and for that reason he decided to design and build his own three-cylinder radial type engine. During all this time he obtained practical experience in aeronautics, acting as a mechanic for the pilots on the old Cicero Field where he incidentally made his first flights in 1910.

Threats of war halted further experimentation with his beloved airplane and early in 1917 he enlisted in the Aviation Section of the Signal Corps of the U. S. Army. Although he did not advertise his knowledge of aviation, due to the fact that he desired to be sent overseas, his experience was soon found out and he was detailed as Instructor in Flying.

After spending the greater part of 1917 in Texas, he was transferred early in the Spring of 1918 to Carlstrom Field, Arcadia, Florida, where, being considered an expert in acrobatic flying, he was soon transferred to the teaching and directing of that type of work, later being assigned to give the much dreaded R.M.A. tests.

When Carlstrom and Dorr Fields in Florida were changed into Advance Pursuit and Gunnery Fields, he devoted his time as instructor along those lines, ending up his career at Carlstrom Field as Officer in Charge of Miscellaneous Flying.

Finding that his chances to try his flying experience against the enemy were futile, the Major married a young lady from Florida and again missed out on the scrapping because his wife proved to be just as big an "aeronut" as he is, having made her first flight in 1918.

The next years of flying were spent at Selfridge and Chanute Fields in Illinois and then the Major decided to retire from aviation and enter the electrical field as electrical engineer and production manager. This, however, proved too tame and he entered politics, but by this time had diagnosed his restlessness as a lack of flying so in 1928 accepted a position with the Aviation Service & Transport Company in Chicago as Chief Pilot and Operation Manager.

Finding a better opportunity with the Continental Air Service in late 1929, he joined them as Chief Pilot, and then seeing even greater opportunities in running his own business, started the Avia Flying Service in the Spring of 1930, which he continued until 1934.

He was then appointed by the United States Department of Commerce as Airport Engineer and Assistant State Aviation Advisor and in this capacity spent considerable time selecting and planning airports in the state of Illinois, working under the direct supervision of the Hon. L. P. Bonfoey, State Aviation Advisor and Chairman of the Illinois Aeronautical Commission.

Among some of his present duties are Chief Deputy Coroner of the Air in Cook County, State Aeronautical Inspector for the Illinois Aeronautical Commission. Among his numerous affiliations he is a member of the Quiet Birdmen, Aviation Post No. 651, American Legion, United States Air Corps Officers Association, Reserve Officers Association, and was first president of the Illinois Air Pilots Association, having been one of the founders of this association in 1932.

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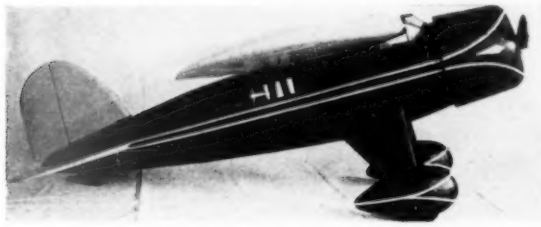
Construction Set Complete, postpaid..... **$4.50**

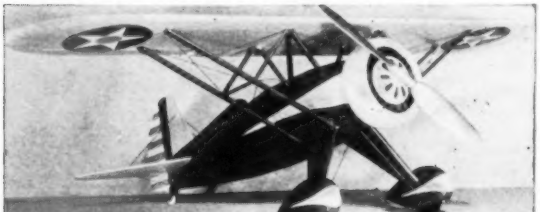
NEW LOCKHEED ARMY SPEED VEGA



41" Span, Length 28½", Weight 7 oz., 1" Scale

A special De Luxe model of one of the latest series Vega. This is a marvelous flyer and has many special strength features. Set contains all parts printed on balsa, a 4¼" turned motor front, 2½" wheels, tail wheel, ready cut pants and landing gear, 11" steel type carved paulownia wood prop, colored dopes, glue, tissue, rubber, and all parts to build. This Model is practically crashproof.
Construction Set, postpaid..... **$4.95**

NEW BOEING F5B2 ARMY FIGHTER



24" Span, Length 15⅛", Weight 2¼ oz., Scale ¾"

A scale flying model of one of the latest fighters. Set contains all parts printed on balsa, a 3" celluloid motor, 3¼" tapered aluminum cowl, colored dopes, 8" carved prop shown. **Construction Set, postpaid**..... **$2.95**

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36" Span, Length 21½", Weight 3¾ oz., ¾" Scale

A special de luxe model, beautifully streamlined. A copy of the new fighter of which the U. S. Army has ordered 100 planes. On Jan. 14 this plane broke the transcontinental speed record at 260 m.p.h. Const. set contains 3" 9-cyl. celluloid motor, 3¼" streamlined tapered aluminum cowl, 2" celluloid wheels, tail wheel, 8" steel type carved pawlonia wood prop shown, colored insignia, lettering, instrument board, 12 ft. rubber, all parts printed on balsa, 3 oz. silver dope, 1 oz. paper cement, 2 oz. glue, full size drawing. **Const. Set Complete, postpaid.** **$3.75**

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COMBINATION LAND AND SEA PLANE SET

32" Span. Length 22½". Weight 3½ oz., ¾" Scale

New 4-gun Navy fighter. Model will rise from land or water in few feet. Construction set contains fuselage and pontoon formers, wing ribs, tips, etc. printed on balsa, a 3⅜" turned cowl front, 2 instrument boards, colored insignia, lettering, windshields, 9" carved scale flying prop shown, 3 oz. silver paint, 1 oz. cement, ½ oz. black, 2 oz. glue, ready cut wheel pants, strong 2" aluminum wheels, 12 foot rubber, large 33"x44" drawing of land and sea plane. This is a sensational model and only one of its type in the world.
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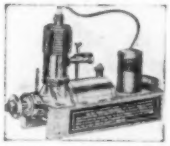
1/5 H. P. Gas-Motor
Weight As Shown 12 oz.



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Construction Set, postpaid..... **$2.00**

BOEING F4B4 NAVY PURSUIT

1/5 H.P. Gasoline Motor Driven Model

68" Span. Length 44". 2¼" Scale. Color Silver

This is not just an ordinary large model, but one specially designed and engineered to stand the strain of the gas motor. The most realistic and life-like model of this size ever produced. As all the fuselage formers, wing ribs, tips, etc., are all cut out and notched for stringers, spars, etc., even a novice can make a perfect model of it with ease. Set contains 6" turned balsa wheels with bearings, rubber tail wheel, a special turned balsa 10" speed, cowl ring used on the latest Boeings, silk covering material, silver and red dope, glue, full size scale drawing, axles; all wood cut to size, etc. Weight of model with motor 3½ lbs.
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1¾" long.....10c
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3/32"x⅛"...15 for 5c
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⅛"x3/16"....6 for 6c
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Packing 15c extra

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1/16"x2"...4c
1/16"x3"..5½c
3/32"x3"..4½c
3/32"x3"...6c
⅛"x2"....5c
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2¼"	9	25c	2⅝x1⅛" 20c
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3⅛"	9	30c	3⅛x1⅛" 30c

MOTORS complete with balancing ring, pushrods, etc.
Cowls to fit motors as listed.
COWL BUMPS, Set of 18..10c

WHEELS

SEND 5c FOR CATALOG

Aluminum Disc Rubber Tired Air Wheels
1" dia.....15c pr.
1¼" dia.....18c pr.
1½" dia.....20c pr.
Bal. Tire Alum. Disc
1½" dia.....25c pr.
1¾" dia.....28c pr.
2" dia.....30c pr.
Bal. Tired Cel. "Disc Wheels
1½" dia.....30c pr.
1¾" dia.....33c pr.
2" dia.....35c pr.

Celluloid Wheels	Balsa Wheels
¾"dia. 06c pr.	04 pr.
1"dia. 08c pr.	05 pr.
1⅜"dia. 10c pr.	07 pr.
1⅞"dia. 18c pr.	10 pr.
3"dia. 35c pr.	35 pr.

Swivel Joint Fork and Axle
⅛ up to ⅝" wheel 10c
¾ up to ⅞" wheel 15c

Treaded Rubber Aluminum Disc
1 3/16" dia...30c pr.
1½" dia.....40c pr.
2" dia.....50c pr.
3" dia.....60c pr.
5⅜" dia....$1.50 pr.
6½" dia....$2.00 pr.
7" dia.....$2.50 pr.
Aluminum Disc Rubber Tired Tail Wheels
½" dia..... 5c ea.
⅝" dia..... 6c ea.
¾" dia..... 7c ea.
⅞" dia..... 8c ea.
1" dia..... 9c ea.
1½" dia....10c ea.
1¾" dia....11c ea.
AXLES—Threaded—fitted with washers, bushings and nuts.
Length 1/16"3/32"⅛"
2"-3"-6"....12 .10 .20
7"-8"-9"....14 .12 .23
10"-11"-12"..18 .15 .25
Postage 3c Pair—on Rubber Tired Wheels, 4c Pair

PROPELLERS

HAWK TYPE PROPS

2-bladed	3-bladed
3¾" 25c	4" 35c
4" 30c	4½" 45c
4½" 35c	5" 50c
5" 35c	5½" 50c
5½" 40c	6¼" 70c
6¼" 40c	7" 80c
7" 55c	8" 90c
8" 65c	9" $1.00
9" 75c	10" 1.10
10" 85c	11" 1.25

DIE CAST PROPS—Standard

2-bladed	3-bladed
1½" 08c	1½" 10c
2" 10c	2½" 12c
3" 15c	4" 25c
4" 20c	4½" 35c
4½" 25c	5" 45c
5" 30c	6" 60c
5½" 35c	7" 70c
6" 40c	8" 80c
6½" 45c	9" 90c
6¾" 50c	10" $1.00

Props can be had up to 24 in. dia. Postage 6c each

CELLULOID MOTORS

Celluloid Separate Cylinders	Celluloid Motors Dia.	Aluminum Cowl Plates	Celluloid Combination
5/16" 3c	1¼" 20c	⅞" 8c	
¾" 4c	2" 25c	1¼" 10c	1½" dia. 25c
⅞" 5c	3" 30c	1¾" 12c	3" dia. 35c
		Postage 3c	

Authentic Airplanes
24 ARMY .....25c Set
18 NAVY .....25c Set
16 WARTIME .....25c Set
84 SQUAD INSIG. 25c
Booklet—Data on army planes, their markings and colors 10c
Postage 5c set

Spun Aluminum COWLS

Dia.	Drag Ring	Open Face	Closed Face
1"	15	15	15
1½"	18	18	18
2"	20	20	20
2½"	25	25	25
3"	28	30	30

Postage 6c

IMPORTANT—Minimum order, 50c. Add postage on all items but if over 15c on less than $1.50 order add only 15c. Orders over $1.50 add 10%; west of Denver 15%.

SELLEY MFG. CO., INC. Dept. 403B
1373 GATES AVENUE, BROOKLYN, N. Y.

Cornelius

(*Continued from page 192*)

rather than the open pit job that the experimental ship is. Mr. Cornelius and his associates have their own wind tunnel and research laboratory where much of their work has been and is being carried on. Tests there prove that the plane will cruise well in excess of 100 miles per hour. A Ford V-8 motor will be employed with very few conversions. The visibility and streamlines are exceptionally good, and as previously stated, the control is excellent. Virtually a flying wing the new creation might not be so conventional in appearance as the one now being used to put the finishing touches to the rigid test requirements of the designer, but it will be very similar in many ways, to ideas being presented by Mr. Vidal in his Chamber of Commerce competition for a light, cheap, economical plane. Because it is to be of this class, great stress has been placed on comfort. Exceptional quiet in the cabin has been acquired without the loss of any portion or any other quality. Conversation will be as easy as in the new automobiles.

The designer, G. Wilbur Cornelius, is well equipped to carry on work of this sort, having previously performed research work in the "Hancock Foundation College of Aeronautics" and "Western College of the Air" after graduating from Washington State University. Because of the difference of his design he is working under a great handicap, as does anyone who strays from the straight conventional. To more thoroughly explain his principals of light plane production, he says "Aviation has sacrificed sales for performance to the point where the industry is still in the nursery as far as possibilities are concerned. The airplane builder and manufacturer must first consider the financial means of the prospective purchaser, and by using motors already in mass production, even though costly in performance, it opens an avenue through which the public can be made air minded. Give the public an airplane they can fly, because primarily their reactions are slow.

END.

Our Courses Cover Flight Instruction, Mechanics, Ship Maintenance, Aerodynamics, Meteorology, Avigation. Also Military and Athletics. Day or Evening. All instruction on actual planes and motors. Write or call. Dept. J.

6 MONTH COURSE $49

U. S. AVIATION CADETS, Inc.
NATIONAL HEADQUARTERS
1345 5th Ave. Watkins 9-0433 New York City

High-Lights

(*Continued from page 174*)

though it is expected to begin and end at Paris and several million French francs probably will be offered in prizes, including a prize of $180,000 to the winner, $90,000 for second place, and $30,000 each to the next three.

* * *

JOHN CASEY, Municipal Airport, Chicago, is quite busy supervising the $2,137,000 W.P.A. project for the improvement of the airport which will include extension and hard surfacing of runways including their widening from 150 and 175 feet to a uniform 200 feet with 18-inch gutters on each side; grading and draining of the entire field; building of a concrete taxi runway around the south half of the field; and a beam landing runway 5,000 feet long for blind landing during fogs.

* * *

S. E. SILL, a Georgetown, British Guiana, businessman, has been sponsoring flights being made by Art Williams and Art Wendt over the Dutch Guiana jungles in search of Paul Redfern, who disappeared eight years ago on an attempted non-stop solo flight from Brunswick, Ga., to Rio de Janeiro.

* * *

JUST had a very pleasant visit with Pilot R. T. Parks, Jr., who has left South America to fly in the States and is joining his pretty wife who is appearing in the "Great Waltz." Tarzan McHale dropped an interesting line written from Seat No. 6 of an American Airlines' Douglas enroute to Washington, piloted by Leslie Van Meter. Which reminds me to do a Bernie and thank all you gals and lads for the nice letters.

* * *

AMERICAN AIRLINES is authority for the fact that women like to fly more than men. This information comes from the stewardess ground school and indicates that the ladies do not require as much attention as men and, believe it or not, they don't ask a lot of foolish questions.

* * *

READERS of POPULAR AVIATION may find a lot of fun flying through the night as short-wave listeners. The actual flight of the giant airliners sweeping through the darkness of night and the blindness of fog may be brought right into your living room by tuning your all-wave set in the daytime between 50 and 60 meters and between 100 and 130 meters at night. Twilight messages will be obtained between 90 and 100 meters.

END.

BRIEGLEB GLIDERS

Send 10 cents in coin for full particulars on this new glider and light plane. Government licensed and on the market. Write Dept. 35,

Briegleb Aircraft Co.,
3234 W. 27th St., Los Angeles, Calif.

AMERICA GOES SELLEY-TEX!

U. S. Pat. App. For

THE REVOLUTIONARY *practical* METHOD OF SIMPLIFIED BUILDING!

NEW

"Thanks a Million" for your approval of our LOWER PRICE policy!

NOW ALL CAN AFFORD THE LUXURY OF SELLEY'S exclusive FLYING MODEL KITS

Thousands of model builders liked the idea of SELLEY-TEX "moulded" construction as soon as they read about it. They agreed that here, at last, was a remarkably simple way to build beautiful, authentic flying miniatures of popular airplanes. Thousands were interested but could not afford our "DeLuxe" line of higher priced SELLEY-TEX Construction Sets. We realized it. That's why we spent more time in experiment and more money in new machinery to perfect SELLEY-TEX kits in the popular price range. Now we are able and proud to present six new SELLEY-TEX "Star" values created with the same care and precision given to our costlier "DeLuxe" models. If you haven't tried this Modern Method of Model Building, you have missed the greatest and most important improvement ever achieved in practical, simplified construction. Enthusiastic letters from novices as well as experts testify to the ease of assembling and to the flying superiority made possible by this "moulded" method of construction. Discover for yourself the many advantages SELLEY-TEX offers over All-Balsa-Stick-Kits. If you like individuality, if you like to be ahead of the crowd, if you like luxury with economy—SELLEY-TEX is the "buy" for you. See the coupon below and ACT TODAY!

10 ADVANTAGES OVER ALL-BALSA STICK KITS MAKE SELLEY-TEX THE "STAR BUY" OF LOWER PRICE FIELD!

★ **MOULDED CONSTRUCTION.** First real advancement in practical model airplane building. The production investment exceeds the costs of most of the All-Balsa-Stick-Kit manufacturers combined!

★ **EXCLUSIVE FABRIC.** Specially close woven and processed by secret formula. The smooth moulded surface can be beautifully finished in any color combinations with dope or lacquer.

★ **EASIER-TO-BUILD.** The moulded parts make it simple as A B C. Novices as well as experts easily and successfully build and fly planes this new simple way.

★ **MORE PRACTICAL.** Selley is discontinuing All-Balsa-Stick type of kit entirely. An analysis showed that less than 2% of those who try can actually complete an All-Balsa-Stick-Kit!

★ **MORE AUTHENTICALLY DESIGNED.** Minute details are moulded into model. Each is an exact, true-to-scale miniature of the original plane perfect in every detail.

★ **MORE DURABLE.** The moulded fabric shells are stronger though lighter. They will not warp, tear or puncture and are practically crashproof and unbreakable.

★ **BETTER FLYERS.** The moulded fuselage eliminates weight behind center of gravity, which is approximately 95% perfect in all models assuring better flying performance.

★ **POSITIVE MEANS OF BALANCING.** Simple ring device correctly balances plane. A new clever feature found only in these moulded models.

★ **PATENTS APPLIED FOR.** The moulded process is owned and manufactured exclusively by Selley.

★ **MONEY BACK GUARANTEE.** A full protection money back guarantee certificate is included in every kit!

75c 15c Postage

REARWIN SPORT

Wing Span...19" Length .....10"

Simple to build and realistic in all detail!

Wonderful Value!

MONOCOUPE

1.25 15c Postage

Wing Span...20" Length ....12½"

Incomparable: A beautiful miniature of the popular original and what a flyer!

CURTISS OSPREY

1.25 15c Postage

Wing Span 18¼" Length ....13½"

Exceptional flight performance, authentic beyond belief. Full military equipment, guns, bombs, etc.

VOUGHT CORSAIR, JR.

Wing Span...18" Length ....13¾"

1.25 15c Postage

This latest formidable looking military plane complete with guns, bombs, etc.

BELLANCA SWOOP

Wing Span...20" Length ....11½"

1.00 15c Postage

A perfect authentic reproduction of this famous London to Melbourne racer.

LOCKHEED ORION

Wing Span...20" Length ....12¾"

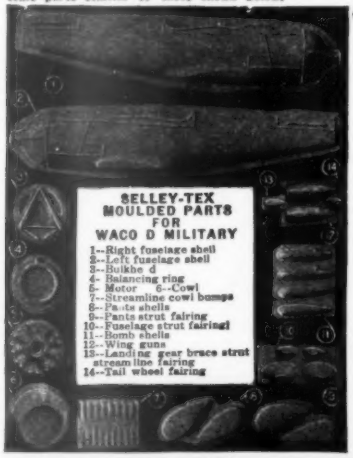
1.25 15c Postage

An amazing realistic replica of this famous transport

PARTS AND ACCESSORIES

Every model is packed in a beautiful, sturdy box with semi-finished flying or scale balsa propeller, formed propeller shaft and rear hook, scaled wheels, with brass bushings, ribs printed out accurately on white sheet balsa, many special turned wood parts, finest grade of balsa wood, sticks, tail wheel and fork fittings, thread, pure para rubber, colored paper, authentic markings, colored insignia, best quality cement, colored dopes, and full-size, easy-to-understand plan.

Each of the SELLEY-TEX Construction Sets contain the necessary individually designed moulded scale parts similar to those shown below.



TYPICAL LETTERS OF APPROVAL!

*Congratulations on your new lower price kits. The "REARWIN SPORT" I bought is the first model I ever succeeded in building and flying. Lots of success to SELLEY-TEX!

*Best wishes for the success of your popular priced kits. Now I'll be able to afford SELLEY-TEX more often. Your moulded-parts make model building much easier.

*Letters on file in our office.

WACO D MILITARY

24" WINGSPAN

4.00

Space permits illustrating only one of the six models which comprise the DELUXE line of SELLEY-TEX Flying Scale Model Construction Sets. All 24 inch wing span. Complete with all tools necessary to build model. For full listing order from coupon or see FREE offer below!

FREE! Just off the press! Write for our new beautiful, two-colored broadside illustrating in detail the new line of incomparable SELLEY-TEX Construction sets. Send 3c stamp for postage.

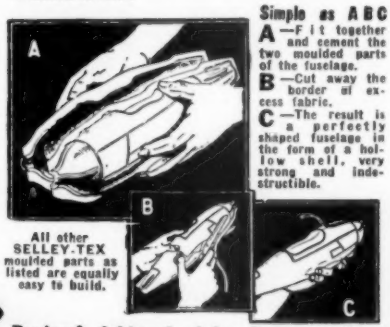
A brand new supply catalogue picturing and listing the most popular plane accessories is yours for the asking. Send 3c for postage.

Simple as A B C

A—Fit together and cement the two moulded parts of the fuselage.

B—Cut away the border of excess fabric.

C—The result is a perfectly shaped fuselage in the form of a hollow shell, very strong and indestructible.



All other SELLEY-TEX moulded parts as listed are equally easy to build.

Dealers! Jobbers! Sales Representatives!

Wide awake merchants will appreciate the tremendous sales appeal of these new competitively lower priced SELLEY-TEX kits. CASH IN on these exclusive sell-on-sight sensations. Write today for complete information, discounts, etc.

Try your leading Dept. store or local dealer first. Use coupon if you can't get SELLEY-TEX. Please mention your dealer's name and address.

Please send me the SELLEY-TEX model kits I have checked. I am enclosing $..... (check or money order.) (Each plane 15c postage. West of Denver 25c postage.)

MONOCOUPE	$1.25 ☐	REARWIN	$.75 ☐
VOUGHT CORSAIR	1.25 ☐	BELLANCA SWOOP	1.00 ☐
LOCKHEED ORION	1.25 ☐	CURTISS OSPREY	1.25 ☐
†NEW RYAN SPORT	3.00 ☐	†FAIRCHILD	3.00 ☐
†WACO C CABIN	3.50 ☐	†BOEING F4B4	3.50 ☐
†WACO D MILITARY	4.00 ☐	†GOSHAWK	4.00 ☐

†These models 25c postage, west of Denver 40c.

PRINT NAME .....

ADDRESS .....

CITY AND STATE .....

DEALER'S NAME .....

SELLEY MFG CO. INC., DEPT 403 B 1373 GATES AVENUE, BROOKLYN, N. Y.

BIG MONEY

Easily Assembling Mead's

New Portable

Outboard

BOAT

Anyone can ASSEMBLE the new OK-2 IN 2 DAYS AT HOME!

WEIGHS ONLY 50 LBS.

Strong as a Giant!

At last! A sensational 50 lb. tough, durable, seaworthy, portable OUTBOARD MOTOR BOAT anyone can *easily* assemble in 2 days at home! (Also available *factory*-built). Take anywhere by *hand* or car! Ideal for auto tourists, fishermen, hunters, campers. Outboard power *or paddle!* Safe. Leakproof. MORE speed per horsepower. MORE miles per gallon! Mead's *perfected* exclusive aluminum-ribbed, Cut-To-Fit Construction Kit *guarantees* successful assembly, easily, quickly,—*and profitably* (if you assemble to sell to others!) Amazing LOW Introductory Prices. Convenient "Pay As You Build" Progressive Group Plan. RUSH 10c *and Coupon below* for full details!

9 HOURS TO BUILD *NEW* SPORTSMAN'S BOAT!

CK-2 Ki-Yak quickly converted into speedy sail-boat!

And here's the famous Mead CK-2 Sportsman's Ki-Yak, paddle and sail—weighing only 30 lbs.—easily assembled at home in ⅓ *less* time with sensational new construction principle. "Home Assembly" saves you nearly HALF factory-built cost. PORTABLE by hand or car. *Thousands* of Mead Ki-Yaks in use the world over! Don't buy *any* boat till you see the many *superior* features Mead cut-to-fit Kits or *Factory*-assembled boats offer! MAIL 10c (covering handling, postage) *with Coupon* for profusely illustrated, colored Circular, Low Introductory Prices and $6.00 Paddle Gift Offer. (Dealers write for Profit Plan). Hurry!

Send Coupon!

$6.00 PADDLE GIVEN with your "CK" Ki-Yak—*if you hurry!*

MAIL COUPON NOW!

Gentlemen: I am enclosing 10c postage, handling charge. Please rush me your New Boat Catalog, Low Introductory Prices and $6 Gift Paddle Offer. (Please Print Plainly)

NAME.....

STREET & NO.....

CITY.....STATE.....

SEND TO:

MEAD GLIDERS 15 So. Market Dept. K-3 **CHICAGO**

Gas Models

(*Continued from page* 197)

When running at 3,200 r.p.m., with a 13-inch diameter, 6½-inch pitch propeller, it develops a thrust of 10 ounces and runs 52 minutes per ounce of gasoline. This is a remarkable performance and sets us to wondering whether this piston ring idea is not a fine stunt. It would certainly tend to maintain the compression and eliminate some of the peculiar antics to which many of the present engines are heir.

We next take a look at the Russian gas model built by N. N. Kazik of the Leningrad Air Club which certainly has a generously fileted wing, with a particularly husky model motor sitting in the nose. When fueled up for a 2-hour flight, it weighs about 9 pounds and has an estimated speed of 60 m.p.h.

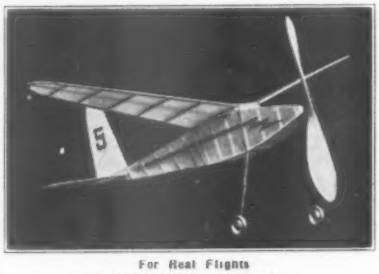
The engine develops 1 horsepower and weighs about 1½ pounds. We would sure hate to get socked in the head with this baby. Mebbe the wide Steppes of Russia provide enough room for this flying rocket, but we doubt it, if she flies for two hours.

And now, fellows, we have nearly run out of photographs and descriptions of gas models. If you like this department, it's up to you to contribute your bit so that we can keep on running. We'd like to be able to print at least six model pictures every month.

We are boosters for the gas model game, and anything that you can send us in regard to your model, your club, your experiences or interesting incidents, will be appreciated by our readers as well as ourselves. We hope to hear from you soon.

END.

CHAMPIONS



For Real Flights

CADET MAJOR—CADET Jr.,

Span 30" Span 20"

Area 102 Sq. In. Area 45 Sq. In.

We are proud to present the CADETS. The **CADET MAJOR**, a fast climbing high altitude soaring airplane with remarkable duration. The **CADET Jr.**, a snappy pursuit style performance airplane with excellent duration. The latest Bunch designs from truly—"The Home of Championship Airplanes—Last week at the big Los Angeles Junior Birdmen indoor contest, every prize was won by airplanes built of Bunch material. These Model Builders are champions because they know what is best. Donahue, the Grand Prize Winner, says to you, "I buy Bunch material. Their uniform high quality enabled me to do the consistent flying that won. I can truly recommend the CADETS."

CADET MAJOR Kit.....Postpaid $1.50

CADET Jr., Kit.....50c Plus 10c Postage

Both Kits, Postpaid.....$2.00

Catalogue 3c stamp

BUNCH MODEL AIRPLANE CO.

2303 S. Hoover St. Los Angeles, Calif.

A Fable

(*Continued from page* 184)

As ever before the world keeps on using dog sleds and woe to the man who tries to put wheels on them.

Now the boys with the unlicensed planes, the ones who are building their own, the ones who are experimenting with new ideas, are in the same boat.

The Dept. of Commerce and rightfully so are, only interested in commercial flying and flying relating to interstate usage. Interstate flying must and should be regulated by the State themselves.

So far most of the States have appointed Aero Commissions, who are in the most cases comprised of people interested in aviation but not pilots. They have, like Moses, issued commandments "Thou shalt not this" and "Thou shalt not that," but unlike Moses failed to stop at ten but continue adding until practically every pilot who really wants to obey the law must either crawl into a hole and pull the hole after him or stop flying.

All efforts have been to promote airline and licensed flying but the real backbone of aviation, the small builders, the experimenter, the flyers of unlicensed aircraft (which cannot be licensed due to lack of A. T. C. or obsolescence of design) have been banned from flying.

To make a plant grow you must feed the roots not water the branches (or provide them with pork barrels) and so with aviation we must do everything in our power to promote flying and experimenting of all types.

Now you howlers for years you have been belly aching, growling and writing letters to ye editor without results. Why? Because howling to the moon won't help. You've got to convince the Commissions and the Public.

So let's get going this time with a bang and see the results.

First, let's see how many you are so we can see if its worth while. Then let's get organized on a plan. The writer has such an idea which he will tell you about in the next issue.

There is only one way to get anywhere and that is, to step on it and step on it hard and quick. We've tried to organize before but it petered out.

In the meantime remember, the Elections are coming, politicians ears are growing larger. They'll listen now, if ever. Let's all get together again. Start the ball arolling and soon merrily we'll fly along, fly along. See you next month with a lot of bright ideas.

END.

Pilots and Future Pilots!

You owe it to yourself to support the NAR Plan for a Civilian Air Reserve, to be submitted to Congress during 1936. Send 10c for an NAR membership booklet and details of the Plan.

NATIONAL AERO RESERVE

Dept. P. 114 W. 16th St., N. Y. C.

GENERAL Headquarters – for Aviation – is found at San Diego. Ryan School of Aeronautics is located at the scene of the most intensive and widest variety of aeronautical activity to be found anywhere in America. Students are in close contact with these important activities:

1. The U.S. Navy's largest flying base, North Island, directly across San Diego Bay, operates continually over 400 planes of every variety.

2. Government aircraft and engine repair shops – largest and finest in existence.

3. The most active aircraft manufacturing area in the world. The factory of the Ryan Aeronautical Company, with which the Ryan School is affiliated, is directly adjacent; and only 100 feet north of the school on Lindbergh Field is the huge new factory of the Consolidated Aircraft Corporation, with over 240,000 feet of floor space; while within a 100-mile radius are located the factories of Douglas, Lockheed, Northrop, Vultee, North American Aviation, Kinner, Solar, Security, and Menasco. A demand by these and other concerns for Ryan graduates greatly exceeds the supply. Why? Because Ryan trained men have proven they are qualified to "fill the bill."

4. Year 'round flying weather. No one appreciates so well as the experienced pilot the advantages to the flight student of maintaining an uninterrupted training schedule. The government flying base was originally established in San Diego on account of its ideal conditions for aviation. This also accounts for Southern California's predominance in aircraft manufacturing activity. Its delightful, semi-tropical weather has brought international acclaim.

A SINCERE COMPLIMENT

The placement department of Ryan has a long list of requests from aeronautical concerns for recommended graduates, which is continually exceeding the number it is able to supply. Ryan training will prepare YOU for one of the many opportunities open for you in aviation!

Right now is the ideal time to start!

5. The Most Important Reason – the superiority of Ryan training. The Ryan School is the oldest aeronautical school under original management; fourteen years of training men for this industry – there is a reason for this record of consistent success. An impelling spirit of progress is the permeating spirit of the Ryan School. Ryan training above all else is sound, thorough, and modern. To make this possible, Ryan has a staff of instructors, every one of whom is outstandingly well qualified in experience and ability. Buildings, classrooms, shops, equipment, and facilities of all kinds are of the finest and meet the needs of modern training for this industry

Ryan School is known as "America's Most Modern School of Aviation" and Ryan sees to it that this lead is maintained. Still more new buildings, new equipment and facilities have just been added.

Ryan IS the G. H. Q. You will choose most wisely if you select the school that will give you the best training, the most complete foundation and whose graduates have the greatest opportunity of realizing their full ambition in aviation.

Get the complete story on Ryan today. Check the course you are most interested in and full information will come to you immediately.

RYAN SCHOOL OF AERONAUTICS, Dept.
Lindbergh Field, San Diego, California PA-3

I am interested in courses checked: Please send additional information.

☐ Transport . .	$1975	☐ Master Mechanics	$550
☐ Limited Commercial . . .	585	☐ Weems Navigation	150
☐ Private . . .	585	☐ Aircraft Welding .	100
☐ Amateur . .	295	☐ Aircraft Radio . .	35

Ryan deluxe Combination Course Transport training plus new Ryan S-T high performance plane 4642

Name_____ Age_____

Address_____

RYAN SCHOOL OF AERONAUTICS

XUM

SOLID SCALE MODELS
Actual Photograph of the D.E.L. Models

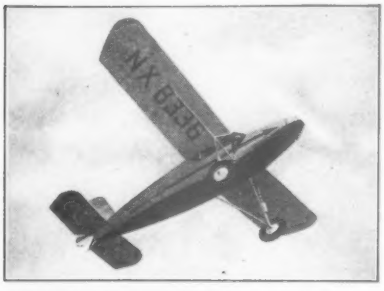
SIKORSKY S-42 Span 17¾"
Kit Complete $1.75

MARTIN "CLIPPER" Span 16¼"
Kit Complete $1.75

Each Kit contains everything required to make a perfect and complete (Balsa) Model. Kits are sent prepaid and insured. Send 3c stamp for illustrated folder. Remit cash by Money Order. No stamps. No C.O.D.'s.

D. E. L. AERO MODEL WORKS, Dept. B
1016 N. Front St. Philadelphia, Pa.

BOYS! MEN!
Fly Your Own!



5 FT. MODEL $1.50 Plus 25c Postage
5 FT. CURTISS ROBIN OR FAIRCHILD "24"

Complete! Consists of finished Balsa Prop. ALL RIBS CUT OUT READY FOR USE hardwood wheels; full size plan; direction sheet; plenty of glue, banana oil, colored tissue; special nose block; rubber; wire; washers; reed; and balsa strips cut to size. And how it FLIES! A tremendous lot of fun for only $1.50! Don't wait! ORDER NOW!

"It's a BURD"
BURD MODEL AIRPLANE CO.
330 Park Ave., Balto, Md.
WRITE DEPT. P. A. R.

Airy Chat

(*Continued from page* 160)

troubling them at all. For example, the railroads, the upbuilders of the nation, have always been the particular target of the politician in his frantic efforts to make himself popular. Yet, in the meantime, the interstate motor-truck companies and buses are allowed to run hog-wild all over the highways built with the tax-payers' money, with practically no limitations at all.

And then there is the petroleum industry which, at one time, was so harassed by Washington that we came near having no gasoline production left. If it had not been for that mighty and aggressive corporation, the Standard Oil Company, we would probably be using Japanese or Russian gasoline by this time.

And when we get to aviation, we find the same old tendency. This is to be feared, because there is no corporation in aviation comparable with the Standard Oil Company, that is strong enough or which has money enough to fight off these attacks. We all know what happened to the airmail last year, we all know what the state laws are doing to the amateur and private flyer, and conditions will continue to get worse unless some public spirited citizen with real combatative ability, comes to the rescue. I wonder who he will be.

* * *

OLD-TIME readers of P. A., dating back to 1930 and 1931, will probably remember the adventures of Bob and Ed in the series called "Practical Lessons in Aviation." When this series was brought to a close, but not completed, we had hundreds of letters requesting its return. And even within the last few months, five or six years later, we have had several letters on the subject.

But, what I wish to know is this. Will our readers be interested in the republication of this series of articles in book form, thoroughly revised and brought up to date with additional chapters and better illustrations? This course in flying was written in the conversational order which at times, lapsed almost into the "question and answer" form. If interested, let me know.

* * *

OUR gasoline model section is progressing in fine shape and we are mighty glad that so much interest has been shown in what is one of my pet projects. The way that the size of the gas models is increasing we are wondering whether it should be incorporated in the lightplane section. There is becoming less and less difference in the size of the gas models and the lightplanes and, except for the fact that the owner does not ride in the model it is becoming increasingly difficult to draw a line between them.

* * *

CARDAN, one of the founders of the calculus and probably the greatest mathematician of all time, was not much of a believer in mass intelligence. He proved mathematically, and by plenty of practical examples, that error increases much more rapidly than truth. It was this theorem that suggested to him, "the ultimate ratios of vanishing quantities" that lies at the base of the differential calculus.

In short, Cardan proved that the greater the number of people believing in an abstract proposition, the less likely was that belief to prove true. This discredits the title of that old song, "50,000,000 Frenchmen Can't Be Wrong." In fact, Cardan would have been much more satisfied had only 500 Frenchmen believed in that project.

This theorem has a direct application to modern aviation in which about 100 people guess right and about 1,000,000 take the wrong path. The wilder and the greater number of the cheers for some new departure, the bigger the bump when it eventually proves false. We have had all sorts of fantastic widely publicized movements promoted in aviation, many of which still persist because of pure mass, that have had absolutely no merit whatsoever. All this against the unavailing arguments of a few level-headed persons who have thoroughly investigated the matter.

* * *

Well, so long, J. B. R.

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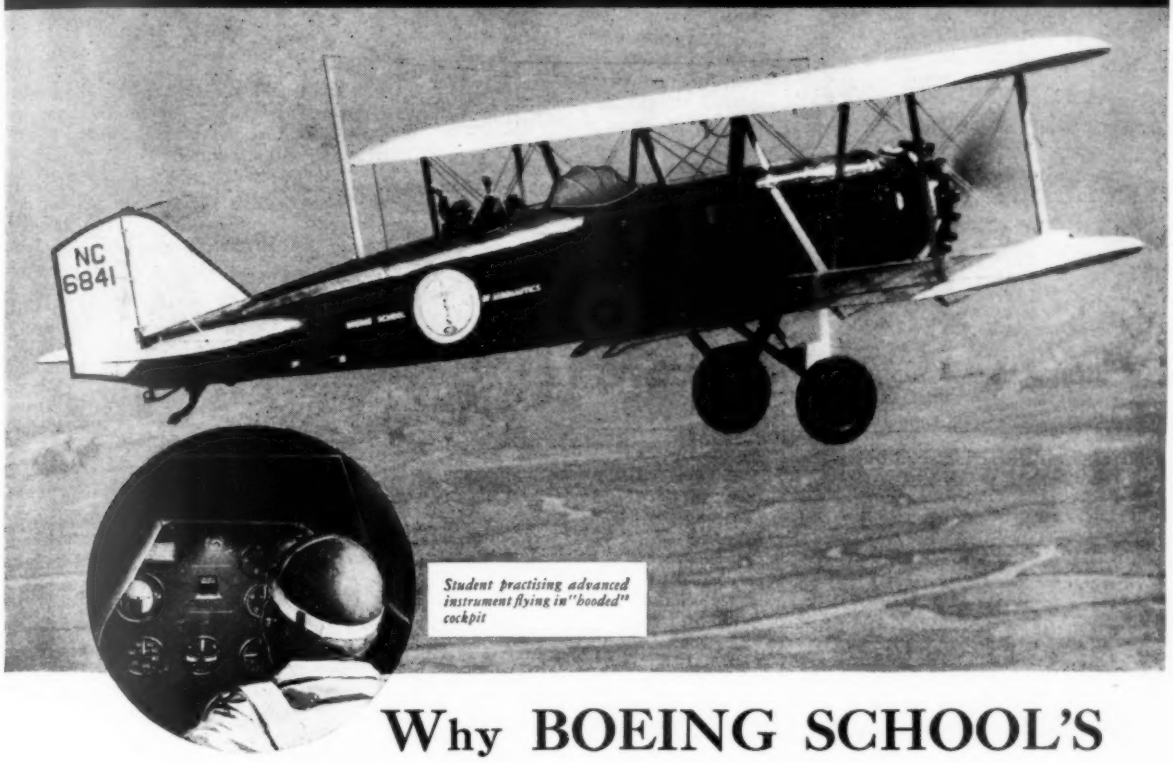

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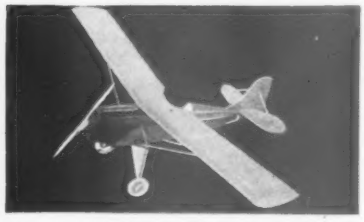

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Air Corps

(*Continued from page* 166)

The Air Corps, with its highly trained personnel, has made many valuable contributions to this new photography. They have cooperated with the Coast & Geodetic Survey of the Commerce Department and the Geological Survey of the Interior Department in making aerial surveys of large areas of the United States.

Captain Albert W. Stevens, Air Corps, is credited with a number of inventions in the photographic world. He has perfected the automatic flashlight bomb, an in-beween-the lens shutter for altitude and distance photography and color filters. He has photographed mountains from a distance of 300 miles or more away.

Captain Stevens is considered an authority in the photographic field and has been chosen to participate in all the principal photographic missions initiated by the Air Corps and other agencies. In recognition of his services he has been awarded the Distinguished Flying Cross and the Mackay Trophy.

A vital milestone in the progress of both commercial and military aeronautics was the establishment, by the Army Air Service, of America's first model airway from Washington, D. C., to Dayton, Ohio, during the early months 1921. It has been said by one of our Air Corps officers: that, "the establishment of well organized air routes throughout a country is as essential to a well balanced system of national defense as the developmental work on the aircraft itself."

The Army Air Service made it one of their jobs to bring this about. They knew that it was as necessary to map out the unexplored oceans of air for safe aerial navigation as it is necessary to charter the unknown oceans of water for safe water transportation.

The installation of airways entailed the location of landing fields with all its facilities, including radio communications, beacons, etc. This was a function of the Airway Section of the Air Corps at first, and turned over to the Department of Commerce in 1926.

An aviator as well as a sailor must have a thorough knowledge of navigation. The Air Corps personnel has spent much time on this subject. They have established schools, where intensive training is done. As time goes on greater stress is being put upon this subject.

Some of the best known navigation instruments owe much of their development to the Army Air Corps. The earth inductor compass, the Kreusi radio compass, and the instrument landing system.

In the flight made by Wiley Post in 1933, circumnavigating the globe in seven days and nineteen hours, a Kreusi radio compass was used. This compass was developed in the laboratories of the Army Air Corps Engineering Division at Wright Field, Dayton, Ohio. It was this instrument that enabled him to keep in touch with some radio station practically throughout the flight.

The most recent tribute to the Air Corps' work along navigation lines was the acceptance, as standard, of the Army's instrument landing system by the Bureau of Air Commerce.

This Bureau for eight months investigated the applicability of this system to commercial transport aviation. After making one hundred and fifty unassisted hooded landings at five different fields and in various wind conditions, they made their decision.

This was indeed a notable advance in aviation. In fact some of our best aviators have expressed the opinion that it is the most important contribution to aerial transportation that has been made.

The Army officers who have done the most to make instrument flying possible, are Major William C. Ocker and Captain Albert F. Hegenberger, the latter having made the first solo instrument flight in 1932. Just recently Captain Hegenberger received the Collier Trophy for 1934 in recognition of his work.

Time marches on and the Army Air Corps personnel and organization continue to keep step with it. Their men are still working in the laboratories at Wright Field, Dayton, Ohio, making every effort in their power toward developing better airplane design and performance. They are still making daring flights, risking their lives many times, for the sole purpose of furthering the advancement of aviation.

The most recent of these flights are the balloon ascents into the stratosphere, a venture in which they are cooperating with the National Geographic Society. The purpose of these flights are to make observations of temperature, and barometric pressure, as well as collection of stratosphere, cosmic ray studies, spectrographs of sunlight and skylight, spore and fruit fly studies, observations of wind directions and velocities.

In 1934 the first attempt was made by Major William E. Kepner and Captain Albert W. Stevens. This however was not a complete success. Just recently another attempt was made by Captain Stevens and Captain Orville A. Anderson, and again the flight met with misfortune just prior to the take-off, thus delaying the venture for a time.

END.

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Can't Be Pilots

(*Continued from page 168*)

job, where there is plenty of work and opportunity, for the more spectacular job of a pilot?

Education is a vital asset for entering aviation in any branch. The better your training, particularly along mechanical lines, the better will be your chance for getting and holding a job. The way things stand at present, a high-school education is almost essential and a college education is much to be desired. This is for the reason that, in its development, aviation has become decidedly "high-brow" because of the technical nature of the recent improvements. This trend, in turn, has led the government to add to the requirements for the license examinations, both for pilots and mechanics.

In taking a government examination for a transport pilot's license, the applicant is faced with a vast array of technical and scientific subjects: physics, meteorology, radio, mathematics, navigation (and this is a tough one), aerodynamics, engines, shopwork and other kindred subjects in addition to the actual flying tests.

Many of these subjects may seem foolish to the average boy or young man, and perhaps some of it could really be omitted, but at the same time, the subjects are required by the government—and that's that. And without the license, the pilot is an economic zero in commercial flying.

"I don't want to study all of that theoretical stuff—it gives me a headache and doesn't have anything to do with flying. I want to fly and not take a college course," is the constant complaint contained in the letters received from P. A. readers. But whether they wish to study, or not, they will have to pass an examination in these subjects if they wish to get a license. That's the fact that cannot be dodged nor side-stepped. All these boys wish to do is to crawl into the cockpit and fly and fly and fly without further study but, of course, this wish gets them nowhere.

After direct contact with literally thousands of boys and men between the ages of 16 and 25 years of age, it is surprising to find the vast fund of useless superficial hodge-podge of facts possessed by these boys. They are living catalogues, so far as the makes and types of ships are concerned, but beyond this "catalogue" stuffins they know absolutely nothing about aviation that would earn them any sort of a ticket. They can distinguish a PBD-26 from an OBD-19-A at a glance, but ask them the meaning of some simple term such as "fairness ratio" or "lift-drag ratio" and they are all at sea. This at once indicates that a boy or man who is willing to apply himself to serious study will meet with but little competition for a ground job.

In short, the average aviation fan plays at aviation—he seldom studies or works. We can't imagine one like this who will ever get as far as a blind-flying course. In aviation, as in any other occupation, steady unremitting study is the only road to success. Even though license laws did not exist and all the prospect had to do was to move the stick and rudder pedals back and forth, aviation would mean nothing at all in the way of earning power because there are plenty of stick-pushers to fill the job. Aviation needs workers and thinkers—not talkers.

By far the best way, as well as the quickest method to get into aviation, is to take a course at an accredited aviation school such as those advertised in POPULAR AVIATION. This applies to any branch of aviation, in the air or on the ground. After graduation, these schools will assist the student to get a job, although, of course, the majority of them cannot guarantee a job because jobs depends to an extent upon the personal character of the student himself.

And, there is another way to get into aviation. Join the Army, Navy or Marines. It is very difficult to get flying training in the government schools because of the stringent regulations and requirements for physical condition and education, but it is always possible to get into a training school for mechanics. To get into Randolph field, the primary flying school of the Army Air Corps is difficult, for graduates from the West Point Military are given first chance. Naturally, the chance of appointment for civilians is small. College credits in any case are absolutely essential.

For training in the ground and mechanical divisions of the service, the U. S. Army Air Corps maintains the Air Service Technical School at Rantoul, Ill. Entrance is by an enlistment for three years but they have a long waiting list. Only an eighth grade grammar school education is necessary at Rantoul but preference is given to men who have related technical experience.

At Rantoul, there is a preliminary four-

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week course, followed by the airplane mechanic's course of twenty-four weeks. In this course, the subjects covered are: airplane mechanics, engine mechanics, aircraft armorer's course, general mechanics, auto-mechanics, oil reclamation, communication, parachute rigging, aerial photography and crew chief course. The students receive $21 per month, board, clothing, subsistence and free medical care.

Every subject taught at Rantoul is a good practical subject that will benefit the student whether he elects to stay in the army or to enter civilian life. One of the most interesting subjects is aerial photography which is treated in great detail at Rantoul.

In the Navy, a four year general enlistment is necessary, admission to the air service being made on a competitive basis. The candidates must pass a mental examination which will require at least a high school education. Many of the applicants have college training or equivalent. The Navy recruits receive a base pay, starting at $21 per month, but can earn promotion up to seventh rating petty officer with pay of $126 per month. As in the Army, subsistence is free.

And now, assuming that you have finished your course in an accredited civilian school in aeronautics, your next course will be to make application to an airline if you wish to enter on this branch of the work. To do this, you fill out a form sheet provided by the company on which is recorded your physical makeup and experience. The form is then accompanied by a recent photograph of yourself.

You will now be entered on the company payroll for a three month preliminary tryout with the rating of an apprentice. In the large city airports, your pay during this period will probably be in the neighborhood of 45-cents per hour. If found satisfactory, you will be retained in the capacity of apprentice for two years, receiving up to 55-cents per hour.

At the end of the two years, you will be eligible for a mechanic's helper, serving two years more up to 72-cents per hour until you take your final examination as mechanic. From this time on, your wages will range from $45 to $75 per week, depending upon the part of the country that you work in and general business conditions. But, it is necessary to serve the two-year apprenticeship in order to obtain a government mechanic license unless you have worked on similar jobs before.

These figures are averages arrived at by a survey taken in and about Chicago. They are believed to be on the safe side, and slightly below actual figures rather than otherwise. But, this is not the limit to which you must aspire for there are executive positions that pay several times the amount mentioned.

It need hardly be said that competency and carefulness are the two greatest assets in aviation, more important perhaps than in any other industry and this accounts for the exacting demands by the employers. The lives of human beings depend upon the care with which each adjustment is made and the security of each individual bolt and nut. "Almost right" is not acceptable in airplane work. "Perfect" is the only acceptable degree.

END.

Douglas DST

(*Continued from page* 190)

cluded for keeping food hot or cold indefinitely without need of thermos equipment now used, and the spaciousness of this department enables the serving of much more elaborate meals than are now possible.

The pilot's cockpit includes every known aid to navigation, including all approved instruments, automatic pilot and the latest type radio equipment. The two engines are capable of developing approximately 850-930 h.p. each (930 h.p. available for take-off and 850 h.p. at 4300-feet altitude) and provide a top-speed of 215 m.p.h. at 10,000-feet. Normal cruising speed at 12,000-feet with 70 percent. available power is 190 m.p.h., with a landing speed of 65 m.p.h. The cruising range is 1,100-miles with 24 passengers or 1,400 miles with 16 passengers.

Power also is sufficient to permit completion of take-off and climb with one engine and to allow uninterrupted flight with full load on one engine. Both engines are equipped with automatic constant-speed propellers, the latest development in this field. These propellers act as an "automatic gear-shift"

Wheels will be retractable, into the engine nacelles, and a new type landing gear construction provides unusual strength and smoothness of landing in this important part of the plane.

END.

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uninformeditis

and not know it!!!

Every day new developments are being made in, and for, the aviation industry —aircraft—engines—parts—supplies—materials—equipment—machinery—developments that will prove interesting and valuable to you.

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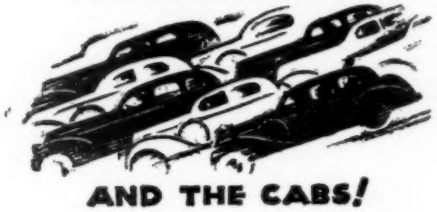

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Business men with steamship pasters, European, Asia and Africa stickers on hard-worn luggage! They know of The Stevens, greatest hotel in the world . . . perhaps better than Chicago knows of it.

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Your mood is here . . . flashing in the dining room, banquet hall, or with white turned-back sleepy bed in a high place of quiet.

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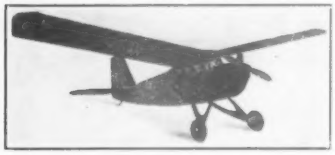
GAS MODEL PLANS
The first plans for accurate, flight-tested gasolene powered model aircraft.



THE "BUCCANEER"
Wingspan: 7 ft. 4 in. Wing Chord: 14 in. Wing Section: Eiffel—431. Weight without motor: 3 lbs. 6 oz. Top Speed: 28 m.p.h. Landing Speed: 13 m.p.h. Glide: 17 to 1. Power: 1/6 to 1/4 h.p.

Six models of this ship were actually built before the final design was adopted by us. A simple ship to build yet it looks and performs beautifully. Has conventional construction and can be powered with any reliable motor which is rated between 1/6 and 1/4 h.p.

THE "CAVALIER"
Wingspan: 9 ft. 0 in. Average Chord: 13½ in. Wing Section: Eiffel—400. Weight without motor: 3 lbs. 12 oz. Top Speed: 32 m.p.h. Landing Speed: 16 m.p.h. Glide: 21 to 1. Power: 1/5 to 1/3 h.p.

This ship is the ultimate in streamline gas models. The picture above shows the ship in actual flight over Caldwell, N. J. Build this ship and you will have a sure contest winner. It flies for twenty minutes on 1/4 oz. of gas. Has a monocoque fuselage and a lightweight cantilever wing.

BERKELEY GAS MODEL PLANS are complete in every respect. All bulkheads and formers are shown FULL SIZE. Each set includes two big sheets, 22"x34" with complete instructions and many valuable hints. Every model builder who contemplates building a gas model should possess these drawings.

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53 Berkeley Place, Dept. P-4, Brooklyn, N. Y.

Aero Clubs

(*Continued from page* 178)

There are sixteen active members and they are forming a Junior chapter of the N. A. A. They are old enough and large enough to form a second chapter of their club and wish all interested persons to get in touch with headquarters.

* * *

WE just received a jolly letter from the Flying Squirrels Club, Chicago, which is a group of earnest young men who list their total assets at one hammer, one saw, one dull chisel and four 2x4 planks. They say that their club yell is, "Aw—nerts," which is not so bad for flying squirrels. However, there is a serious side to this club and they are earnestly trying to get somewhere in this flying game. They are going to build a Galloping Flea or know the reason why and, as they say, they have four planks laid up against that time when they can get something to hold the planks together.

Of course, just as the letter was getting interesting, they failed to give their address. If they will write in again, I think they can swell their membership by two or three young fellows who call at our office.

* * *

WE received a short notice, which we wish had given us some details, from the Kewaydin Glider Club, 311 Coombs Bldg., Haverhill, Mass. William R. Shepherd is the secretary.

* * *

THERE is sure a live bunch up in old Wisconsin. When we say this, we refer to the Wisconsin Civil Air Corps, 2123 N. Farwell Ave., Milwaukee, Wis., who are doing some really constructive work. It now has 80 members that meet the first and third Monday of each month at the Milwaukee Y.M.C.A., and they ask us to steer all aviation notables in their direction for talks at their meetings.

They have tackled the job of having the power lines grounded and are getting somewhere with it. The electric power company is working on a cost estimate covering the rerouting of their lines and lowering or burying all of the lines at their three airports, and also at all airports in the eastern part of the state. (This is sure something worthwhile.—Ed.) They have been aided in this work by the Wisconsin News, which runs two pictures, each week, of dangerous pole-lines near the airports.

As Harold Sinskey tells us, one of the biggest improvements that they are trying to put through is a marking project for all towns and highways through the State of Wisconsin, "to help strangers who are using dime-store compasses to find their way." This has resulted in a W.P.A. project and the administration program covers maintenance by the various counties for the next two years at least.

We congratulate this alert, alive and successful group upon their ideals and achievements—and are doubly sorry that we can't go to that dance. Mebbe we'll have better luck the next time.

WE have a fine letter from Elmer L. Smith, secretary of the Private Flyers Association, Eugene, Ore., of which we spoke last month. We again wish to thank him for the copies of their club bulletin, "Fly-Paper," which is getting better and better all the time. Mr. Smith states that the P.F.A. has enrolled 95 per cent of all the amateur pilots, private pilots and plane owners in the State of Oregon.

A CHINESE fraternal organization, known as the Curtiss-Wright Tech Chinese Students' Club, has been organized among the students attending the Curtiss-Wright Technical Institute of Aeronautics at Grand Central Air Terminal in Glendale, California.

The eleven students forming the club are attending the Institute as non-quota residents in the United States for educational purposes. Representing many areas in China, the body includes graduates from three Chinese Universities: Soochow University at Soochow, Chiao-Tung University at Shanghai and the Central University at Nanking.

The three-fold purpose of the club is to develop closer acquaintance and sociability among the Chinese students, to make possible mutual assistance in solving the problems that confront them in their education and to include in their activities the development of an international good will. The execution of this last purpose of the club is enhanced by the fact that the student enrollment of the Institute includes 18 students from eight foreign countries.

END.

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Become an Aeronautical Engineer. Tri-State College course given in 108 weeks. Bachelor of Science degree. Graduates in Mechanical Engineering can complete aeronautical course in 2 terms (24 weeks). Thorough training in all fundamental engineering subjects. Equipped with wind-tunnel (see illustration). Non-essentials eliminated. Courses designed to save student time and money. Flying school facilities available at nearby airports. Properly trained engineers in design, research, manufacture and sales work are in demand. Enter March, June, September, January. Courses are offered also in Civil, Electrical, Mechanical, Chemical, Radio and Architectural Engineering; Business Administration and Accounting. Living costs and tuition low. Those who lack high school may make up work. World famous for technical 2-year courses. Graduates successful. Write for catalog.

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TRI-STATE COLLEGE

Campbell Plane

(Continued from page 178)

The ailerons are the slotted type, running the full distance of the trailing edge.

This job was designed and built with comfort, roominess, convenience, and visibility, as well as performance, the ultimate aim of the architect, Hayden Campbell. The dashboard is as handy and convenient as could be designed, and has a complete outlay of instruments. The spark, choke, throttle, and starter are all within "thumb-to-finger" reach.

The brake protrudes from just beneath the dash; the standard brakes from the Chrysler Airflow being used. The wide seat and exceptionally soft upholstering tend to give the greatest comfort possible on a long jaunt in a plane of this type. The duals employed are as on the larger transports.

A wheel is used rather than the stick, so common to the lightplane. This control is easily and immediately swung from either side to the other. Wide doors on either side of the cabin give access to the seat, doing away with the habit of tying one's self into the proverbial knot when entering or leaving the plane.

The starter is exactly the same as used in the Ford car, and is "juiced" by a standard battery, this being located in the roomy baggage compartment behind the seat, as in the Ford Tudor.

This little ship has more than spoken for itself in tests on closed courses, being timed from other planes as well as by a ground timer and also paced by planes with a known top speed, it is known definitely that the Campbell will cruise at 110-115 m.p.h. with a conservative "top" of 130 m.p.h.

The stability, while in the air is far above that for the average plane of this type, and the landings are light although the designer brings the ship in with a very low nose. This fact caused a near panic at the Kansas City Municipal field when Campbell was landing for the first time on that port.

As the diving glide was started, preparatory to landing, shouts went up from the crowd; some expected a crash. A sudden hush fell, then more exclamations as they witnessed the strange landing. To quote the Kansas City Star, "The little plane literally 'flew into the ground' and settled down to an immediate and smooth landing."

When Campbell returned to St. Joe, he had sufficient instruments to thoroughly complete his tests, the results of which we shall all know soon.

This gentleman was flying in the American Army back in '17, and knows the game from the ground up. He left the army as a lieutenant, and since that time has been in his home town, St. Joseph.

It is interesting to note the ease with which he puts his bird in its nest at the close of a busy day. Should it be sitting in some corner of the field he climbs in, pushes the starter button on the dash board, and the motor fires as quickly as does its sisters, still being used in automobiles.

The little plane turns on its own length, and glides smoothly, quietly, and quickly to the hangar doors where it pivots and enters; another pivot and its nose is against the wall. With a dying whimper the motor jerks hesitatingly to a stop, as if hesitant to withdraw from its own element, even for a few hours.

It is just an example of that fine type—the pusher—returning to popular favor. The tractor, which was essentially a military type, displaced it for a time but the pusher is coming back and coming back strong.

The hangar doors clang shut, and the Campbell creation is momentarily free from undergoing the rigid tests demanded by its creator; the curious comments of the onlooker. Another day is through.

END.

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Only one man will be selected in your neighborhood. No money required as we foot all the expenses in connection with advertising our entire line. Our representatives can capitalize and cash-in on our valuable trade name and the large amount of national advertising put behind AVIATION PRODUCTS.

Liberal commissions offered and our representatives will be given every opportunity and encouragement to turn their franchise into a very profitable business. An easy way to set yourself up in a sound aviation business. Work right in your own neighborhood during your spare hours.

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Only one man in your neighborhood will be selected and given exclusive franchise for the territory. To be eligible you must be able to line up at least one used airplane in your neighborhood that is for sale. References required. If retained you will receive commission on all used planes sold by us OUT OF YOUR TERRITORY as well as receive commission on any used planes from other territories that may be sold INTO YOUR TERRITORY.

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If 18" lengths are desired, take ½ of 36" length price. If 3" widths are desired, double price of 2" widths sheet Balsa.
Thinner same price as clear dope.

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36" Lengths

	Per 100
1/32x1/16	10c
1/16x1/16	10c
1/16x⅛	20c
1/16x3/16	25c
1/16x¼	27c
3/32x3/32	25c
⅛x⅛	30c
⅛x3/16	50c
⅛x¼	55c
⅛x⅜	65c
3/16x3/16	50c
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¼x⅜	$1.25
¼x½	1.60
⅜x⅜	1.90
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STANDARD PITCH BALSA PROPELLER BLOCKS
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⅜x½x5	8c
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⅝x1x7	14c
⅝x1x8	18c
⅝x1x9	25c
⅝x1¼x10	30c
⅝x1¼x12	35c
1x1½x12	40c
1x1½x15	55c

BAMBOO
1/16 sq. x 14, 1 gross for 20c
1/16x¼x11, 1 doz. for 5c

36" Scale Craft Flyers. . . . Movable cockpit controls, simplified plans, alum. cowl, carved prop, . . . dealers are making enormous profits on our kits . . . write for dealers' discounts. . . . Your choice of the POST-ROGERS LOCKHEED $1.50 each. . . . MONOCOUPE . . . $1.25.

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1x6, each	35c
1½x1½, each	25c
2x2, each	25c
2x3, each	35c
2x4, each	45c
2x6, each	60c
3x6, each	$1.25

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36" Lengths

1/64x2, 10 for	14c
1/32x2, 10 for	15c
1/16x2, 10 for	18c
3/32x2, 10 for	21c
⅛x2, 10 for	23c
3/16x2, 10 for	32c
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With every order; . . . 1 skein ½" flat rubber with every order . . . wholesale price of this rubber is 45c. Such gifts add materially to your profits.

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12½x16, each 19c
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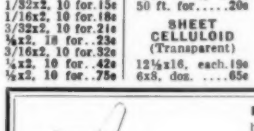

12" per doz. 45c
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FRESH PARA RUBBER AAA GRADE
Per 225' skein

1/32 sq.	25c
.045 sq.	35c
3/32 flat	35c
⅛ flat	40c
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Lb., any size	$1.25

CELLULOID WHEELS

¾" dia., pr., per doz.	24c
1" dia., pr., per doz.	25c
1¼" dia., pr., per doz.	25c
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12 pr. & rudder and tail markings with gummed back.
Doz. 26c; 100, $1.75.

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1/16 diam., per 100	12c
3/32 diam., per 100	15c
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White, per doz.	12c
Colored, asst., per doz.	15c
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White, yellow, orange, blue, red, green, olive drab, black, silver, gold or grey.	
1-oz. bottles, per ⅛ doz.	25c
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4-oz. bottles, ⅛ doz.	$1.00
1 pt., each	50c
1 qt. each	85c
1 gal., each	$2.25

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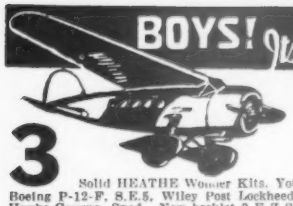

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3/32x3/32	20—.05
1/8x1x8	20—.05
1/8x3/16	14—.05
1/8x1/4	10—.05
3/16x3/16	10—.05
1⅛x1¼	8—.05
1/2x1/2	3—.05

18" BALSA SHEETS

1/64 x 2	.5—.10
1/32 x 2	.7—.10
1/16 x 2	.7—.10
3/32 x 2	.6—.10
1/8 x 2	.5—.10
3/16 x 2	.4—.12
1/4 x 2	.3—.11
1/2 x 2	.2—.12

(For 3"x18" double 2" width cost.)

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.002 thick.... .08
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¾" long..4c ea.
1¼" long. 9c ea.
3" long. 14c ea.

2 BLADED PROPS

1¼" ..... 9c ea.
2¼" ..... 14c ea.

3 BLADED PROPS

1¼" .....10c ea.
2¼" .....15c ea.

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⅝x1⅛x10.1	—.04
⅝x1⅛x12.1	—.05
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4 oz. .15 1 pt. .50

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1⅜" .10 1⅞" .16

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5 large sheets .05

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Suicide Bombers

(Continued from page 172)

Many naval pilots believe that three bombing planes are sufficient to engage one capital ship and give a fair chance of success. They admit a greater liability to damage by anti-aircraft artillery by their methods than does the army, but state that much of this liability will occur after the bombs have been dropped. At that, they expose fewer airplanes per ship-target than do the Army bombers, with their methods of horizontal approach which used to call for nine or ten airplanes per battleship, these airplanes each using one 2,000 pound bomb.

The Army bombers approach in formation at high altitudes. Bombsights have been developed to such a degree that remarkable results are now actually being obtained. The probability of effective hits on a target the size of a battleship used to be 1 in 9 when bombing from normal high altitudes. It is understood that this ratio has been bettered by recent tests.

The majority of Army pilots, except those in bombardment units, have never seen these sights. It is probable that the valuable secret of their design and construction is entrusted only to the bombardiers of the airplanes on which they are installed, plus a few trusted civilian technicians and the technical officers charged with their development.

With an *effective* range of 18,000 feet, 3-inch anti-aircraft guns on a ship under the most favorable circumstances will only have the bombardment formation under fire for 36 seconds before the bombs are released plus another 36 seconds while the bombers are getting away, assuming the bombers to be at 10,000 feet and their speed to be at 200 miles an hour; also assuming the ship's lookouts spot the formation in time for the guns to open fire as the formation comes into their zone of effective fire.

It might be well here to discount the talk of 70 percent hits being made by an anti-aircraft battery against any target but a stationary one. A battery of guns should bring down a captive observation balloon, blunderingly brought within their effective range, with a few shots.

Claims of supernatural prowess against fast moving airplanes, however, are made only by inexperienced or rabid anti-aircrafters. Experienced personnel, instructors from the Coast Artillery School and the Army's Command and General Staff School among them, state that if the A.A. gunners drive the bombers to a high and safe altitude they have justified their existence; as the higher the bombing altitude the greater the chances of bombing misses and the more airplanes required against each target. In other words, the enemy air force will have to use a group to perform the missions otherwise accomplished by one squadron were the A.A. gunnery absent or ineffective. Of course, the percentage of A.A. hits will increase materially when errors are obligingly removed by the faulty bombing tactics of the airplane pilot.

But let us listen in on a recent lecture given by an anti-aircraft artillery instructor, Lieut. Col. James B. Crawford, to the officer-students at the Army Command and General Staff School at Fort Leavenworth, Kansas. "Do not," he said, "picture the anti-aircraft artillery as opening an umbrella over our forces, ashore or afloat, so as to prevent enemy air observation or air attack. Such an idea is erroneous, because there will never be enough such artillery to do that job."

Readers interested in the subject of anti-aircraft tactics may purchase the War Department Coast Artillery Manual, Volume II "Anti-aircraft Artillery" Part I "Tactics" from the Superintendent of Documents, Washington, D. C., for 20 cents the copy.

Even while discrediting the "suicide bombing" therefore we cannot say it will never succeed. It will, at times, but not often. It is the Army Air Corps bombing tactics that give the Anti-aircrafters the greatest trouble; offering deflection as well as range errors, and being under effective fire for a minimum of time.

Both the accepted forms of Army and Navy tactics have their advantages and disadvantages. Both are suited to the design of the airplanes involved, the types and sizes of bombs in general use by the two services, the respective tactical situations in which the Fleet Air Service or the G.H.Q. Air Force will most probably find themselves and many other tactical and technical considerations.

Either form is better than the "suicide bombing." Maybe the latter is more romantic; but ask the service flyers themselves as I did. They'll tell you that there's more romance in doing a job well and returning home in shape to do more of them for your country.

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Under the Hood

(*Continued from page* 170)

their situation to that of a mariner. At sea, a navigator figures his DR and CR at intervals. DR means his dead reckoning position, computed from the course the ship has been following and her actual water speed. CR means his current reckoning or computed position, allowing for current or drift. Each 24 hours the navigator takes a new positive celestial fix as a positive check.

In a plane, the pilot establishes fixes by referring to ground land marks, such as a mountain peak, or from radio stations or marker beacons. Whereas a mariner must be a good navigator, the pilot must be a super-navigator. And radio now has developed to the point where it enables him to identify his position, even on a stormy night, with certainty and precision.

A new landing technique is being developed which it is hoped will enable pilots to bring down their planes with certainty of pleasant contact with the ground. This will explain further my brief description of a beam landing.

At Oakland the Department of Commerce has installed landing beams, down which students have practiced landings in our tri-motored Boeing 80 transport, which serves as a flying classroom to train students in aerial photography and various phases of instrument flying, including beam landings. This will give you a preview of how pilots will be landing under bad weather conditions in the future.

In addition to regular flight instruments, one of our training ships has been fitted with five radio indicators, as follows:

1—Long wave radio beam receiver, for Department of Commerce Broadcasts.

2—Short wave airline receiver for communication with airline stations.

3—Receiver for localizing beams of the field landing system.

4—Flight path receiver, to indicate altitude.

5—Marker beacon receiver, indicating when the ship is over the cone of silence of the airway radio beam station.

One and two are aural; three and four, visual. The marker beacon receiver flashes the neon light.

This is not "blind" flying as we knew it a decade ago. These students are learning to "see" in the hooded cockpit before they ever are permitted to look out from an open cockpit on the earth. For that reason, we think we are training more skilled, self-reliant pilots.

Why the stress on instrument and radio flying? Here, I think, is an adequate answer:

As Mr. Igor Sikorsky pointed out recently, whereas ocean-going transport faces a maximum speed of about 50 miles an hour on the high seas, being stopped by the polar ice caps at the ends of the earth and continental shore lines wherever steamers encounter land, and automobiles and other land transportation are confined to the earth's surface, craft of the air know no limits.

In the air we can reach any spot on the globe by traveling a straight line. Because of that fact, there seems to be no immediate limit in the size and speed of airplanes. Undoubtedly planes several times larger than those now plying the airways will come into service in a short time.

We find a new class of young men entering aviation, hoping to fly these great ships. Three-fifths of those enrolled at the Boeing School of Aeronautics have attended college. They average, in fact, two and one-half years in college classrooms before dropping purely academic training for the overalls of an aviation student.

Having cast their lot with the air, what may they expect? The ultimate aim of many is to climb into an airliner as first pilot. Before succeeding to that important post they must pass the Scheduled Air Transport Rating Test of the U. S. Department of Commerce. Before being permitted to take the test, each must have had 1200 hours of flight instruction and flying experience.

Excepting for the required time, a graduate "airline pilot" with 250 hours of instruction, single-engine and tri-motor experience, usually is well qualified to pass the test. Meantime, to acquire the necessary hours, he may serve as co-pilot or mate for a period of one to four years. His duties? Relieving the pilot of regular flying duties by doing most of the instrument flying, checking gas and oil before each flight, conducting radio communication and, on some lines, attending to passengers' wants.

In the near future the mate will play an even more important role in flying his ship, thus acquiring valuable experience for that proud day when he "takes over". He will bear a larger share of the flying job, for as we move on to bigger ships and fly longer distances at higher speeds between stops, the mate will fly the ship, applying course and altitude corrections to the automatic pilot while the chief pilot navigates and directs the flying. For that reason, the co-pilot must be fully qualified in instrument flying from the first day he steps into a regular run.

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Reduces friction, overheating, wear. Increases r. p. m. and power. Used and recommended for remarkable results by plane services and individual flyers. Write for FREE important photomicrographic and other facts. Manufactured and Guaranteed by Pyroil Company, W.V.Kidder, Pres., 510 LaFollette Ave., LaCrosse, Wisconsin, U.S.A.

NEW!! ALL WAVE POCKET RADIO

Fits in any pocket easily. Weighs only 4 ozs. as shown! NO tubes batteries or electrical connection needed! Nothing to wear out or need replacement—only one moving part. Separates and receives ALL stations with beautiful clear tone by simply hooking to any metal object as desks, beds, telephones, etc. Range up to 100 miles—much greater under good conditions—very little static! Can be used by ANYONE ANYWHERE! Foolproof—NOT a cheap CRYSTAL outfit! Absolutely *complete* with midget phone and directions to use on bicycles, Autos, in offices, hotels, camps, at home, etc. No messy hookups! THESE ARE FACTS! Send only $1.00 and pay postman $1.99 plus postage or send $2.99 (Cash, Money order or Check). Ideal gift. Guaranteed. Order NOW! (Foreign orders 65 cents extra). At Better Dealers. Tinytone Radio Co. Dept. P.A. Kearney, Neb.

$2.99 complete

Classified

GAS MODEL BLUEPRINTS!—9-ft., sturdy monoplane design. Complete set, only $0.75.—Peyton Autry, Boonville, Indiana.

AIRCRAFT, structural drafting, estimating, for experimental, identified light planes; also sleds, hangars. Prices reasonable.—Clayton Kennedy, 1038 3rd Ave. West, Birmingham, Alabama.

A PRACTICAL COURSE in Acrobatics and Inverted Flying, fully illustrated, $1 complete. Details free. 100 used planes, factory built, $70 up, terms, trades, instruction, complete. Directory 25c, postpaid.—Aircraft Directory, Athens, Ohio.

FOR SALE—Licensed Curtiss Challenger Robin, 185 H.P. in excellent condition, $1,000.00.—C. R. Fritschle, 7700 Country Club Ct., St. Louis, Mo.

WANTED—World war machine gun relics rendered unserviceable without marring. No Locket. German, French, British.—M. W. Carder, 222 E. Chestnut St., Chicago, Ill.

WANTED—Franklin Utility Glider in flying condition. Will buy cracked up whole or in parts. Give full information.—Warren Merboth, Glen Rock, N. J.

HISSO 150, 180 and 300-360 engines and parts at ridiculously low prices. These make excellent airplane and stationary power plants. Write for quotations. Karl Ort, 659 W. Poplar St., York, Pennsylvania.

MONOPLANE—2 place, welded steel fuselage, 80 H.P. motor, complete, uncovered, brand new. Bargain $250.00; converted Ford-A hub and propeller $65.00; new 2 cyl. Opposed, 30 H.P. motor complete $85.00; converted Harley $30.00; Acetate Dope 95c gal. Lists 6c.—Aero Shop, Box 164, Pottstown, Pennsylvania.

FOR SALE—Converted '28 Chev. Motor, good shape and 5-ft. steel adjustable prop, $60. Excellent for ice, snow sled.—Vincent Devine, Eldorado, Kansas.

6-FOOT Curtiss Robin Kit, $1.25 postpaid in United States only.—Woburn Model Airplane Shop (Dept. 6PA), Woburn, Mass.

FINANCIAL backing to construct and test experimental light cabin monoplane sought by experienced pilot-designer. Contemplate putting plane on the market.—John L. Brown, Momence, Illinois.

PHOTOGRAPHS—Aviators, Planes, Celebrities, Scenic. All sizes. Sample and price list, 10c.—Ralston Photos, 612 No. Denny, Indianapolis, Indiana.

PHOTOGRAPHS of British and European Air Liners. Post card size 20c each, $1 per ½ doz., $1.50 per doz.—Line 35, Ridgemont Ave., Coulsdon, Surrey, Eng.

ARMY-NAVY gives free Radio Operators' training for service on aircraft, ships. Salary, expenses paid. Information pamphlet, How to Apply, 20c.—Continental, Box 344, Dept. 11, Indianapolis, Ind.

FOR SALE—If you are looking for a Realox job, read this; American Eagle, late series, detachable motor mount, licensed for Kinner. Less than 200 hours on ship. Completely rebuilt, new fabric, cowling, propeller and motor (turns 1,400, Perfect Circle Rings) Bendix wheels, safety glass windshield. Painted Travelair blue. Just relicensed. Priced for quick sale at $350 cash. Completely overhauled extra motor goes with ship at $25. Write or wire.—G. Lytle, Columbiana, Ohio.

USED AIRPLANES $50.00 AND UP—"Easy Payments." Literature 10c.—Continental Sales, Box 344. Dept. 11, Indianapolis, Ind.

AIR COOLED MOTOR—Build latest air cooled motor from Model A Ford parts. Castings supplied by us at $47.50. Write for particulars.—Hallman Aircraft, 694 E. 7th St., St. Paul, Minn.

BARGAIN—Package of Aviation magazines. Publishers surplus, news-stand returns. Flying Aces, Sky Birds, Dare Devil Aces, Battle Aces. 20 assorted copies, each one different, containing 2,500 pages, 200 pictures, for $1.00 postpaid.—Continental Sales, Box 344, Dept. 11, Indianapolis, Ind.

BUILD your own Midget car or lightplane from Storms Plans. Engines, air propellers, hubs, chains, axles, wheels, etc., at bargain prices. Circulars 10c.—Storms Aviation Co., 13 Southside Ave., Asheville, N. C.

Barter and Exchange

Notices in these columns are confined to trades. Cash sale advertising must be inserted under the Directory or Classified columns. Notices in the Barter and Exchange columns, three cents per word.

AIRPLANES, ETC.

HEATH, Aircamper, Skyscout, Longster, Georgias, Corben, other lightplanes, parts, kits, blueprints. Model A converted. Want cash, Heath blueprints, parts, Hendersons, Lawrence, Harlequin, wheels, etc.—Earles, Hayes, South Dakota.

SELL OR TRADE—Licensed and licenseable equipment "dirt cheap" immediately. Swallow TP 2-place biplane. Pheasant 3-place biplane. LeBlond "90" 7-cylinder engine. Wood and metal propellers for OX-5, LeBlonds, Kinners, etc. 30x5 Sauzedde wheels with brake assemblies, Goodrich tread tires, tubes and discs. 14-3 tail wheel, Goodrich tread tire and tube. Pair oversize wheels with 16x6 tires and tubes (Ford, Plymouth, etc.) replaces 26x4. Full NACA cowling for LeBlond, Lambert, Velie, Genet, etc. Send dime for itemized detailed lists.—Howard Tubbs, Whitewater, Wisconsin.

SALE OR TRADE—Fast dirt-track racer; Miller type body; Ford "A". Won many races. Want Waco 10 (OX5) or similar light plane. Cash value $550.—Everett S. Gates, 87 Washington Ave., Nyack, N. Y.

TRAVEL AIR 6,000 J.5. 6 place, 341 hrs. total, just completely recovered, just licensed, new cables, new battery, landing lights, flares, bostin crank starter, bank and turn cabin heater, just spent $450.00 on ship. This is a good ship to carry passengers for 50c. My intentions, but forced to sell, price $1,375.00, will accept late model small car. Aronica or Taylor Cab in trade, balance cash. Also 10% Disc. on new Harley Davidson parts, also bargains in used parts.—Harley Davidson Sales, 570 Portage St., Kalamazoo, Mich.

FOR QUICK SALE—Factory Built Heath complete, ready to fly; $50.00 or will trade for what have you. Also turn and bank indicator $10.00.—Mr. R. S. Hick, 304 E. 3rd St., Rock Falls, Ill.

MODEL A with new prop. Pietenpol conversion, needs cylinder head, mag. and mount, carburetor and intake. $30 or ?—Macon Banks, Rt. 3, Box 398, Ft. Worth, Texas.

WACO 10—Just had major overhaul on ship and motor. $500.00. Or will take late model car in trade.—Herbert Wilson, Graceville, Minnesota.

TRADE OR SELL—Corbin Junior Ace, Szekely 45 H.P. Motor Mead Glider, with landing gear; Used propeller for Szekely 45 H.P. Motor.—R. E. Koontz, Bremen, Indiana.

WANTED—2 or 3 place light plane. Must be in good condition. Send photo. Will swap Harley-Davidson, Motor, and Cash.—Billy Taylor, Maced, Kentucky.

WACO 10—License expires Feb. Trade for light plane, Row Crop tractor. What have you, or $350.—Milton McDonald, McAdoo, Texas.

WANTED—Wings for OX Robin. Have OX5 Travel-Air 2000, good prop. and motor, uncovered, $120 or trade. Also have Heath Model V with Henderson motor for best offer.—Alvin Nelson, Dell Rapids, S. Dak.

WANTED—Four place Monoplane and three place aircooled Biplane—Ships must be at bargain prices, in good condition and licensed—Send complete description and photo in first letter.—Al Vint, Sheldon, Iowa.

TRAVELAIR 2000—In need of recover and repair, complete with 30x5 wheels, pioneer compass, and good Millerized OX. Sale or trade.—Olav Fostervold, Route 3, Willmar, Minn.

WANT—Pietenpol air camper, trade 31 Ford coupe or cash.—Evans, 2115 Johnson St., Alton, Ill.

SELL OR TRADE—Airplanes, magazines, plans. Wanted an air motor or money.—Paul V. Allen, 8 Highland Ave., Bethel, Conn.

FOR SALE OR TRADE—B-4 Heath Midwing (cracked) motor can be put in condition for $20. Fuselage ready to recover, wings need minor rerigging. $65. Carl A. South, 801 Broadway, Columbia, Missouri.

SALE OR TRADE—First six factory built kits to Corbin Super Ace. Already Assembled. Includes wings and tanks, welded tail surfaces and fuselage. Want 30-40 H.P. Light plane motor and air wheels.—Joe Tardy, Jr., 121 N. 7th Ave., Phoenix, Arizona.

SALE OR TRADE—OX5 2 place biplane, cheap. —Harry Evans, White City, Kansas.

BARGAIN—Will sell Cheap or Trade on light plane OX5 combination Eaglerock, Needing wing

(Continued on next page)

covering and other minor repairs.—Wm. H. Trutt, Box 78, Hummels Wharf, Penna.

WANTED—Light licensed ship "Eaglet" or ?—Frank Baumstark, Glen Ullin, N. Dak.

201 AMERICAN EAGLE, Kinner K-5, Steel Prop. Brakes, Turn & Bank, Airspeed, Siren, Duals, 165 Hours. Will take late model car in trade. What have you?—Blesser Motor Co., Concordia, Kansas.

4 PLACE CABIN American Eagle, 165 H.P. Continental. About 65 hours. Comfortable, lots of visibility. Will trade. What have you? Late model car preferred.—Blesser Motor Co., Concordia, Kansas.

FASTEST OXX job in the middlewest—New Lincoln-Page. Must be seen to be appreciated. Will take late model car in trade.—Blesser Motor Co., Concordia, Kansas.

OX5 WACO TEN—New cover on fuselage. Ready for license. A dandy ship. Will trade for late model car.—Blesser Motor Co., Concordia, Kansas.

MISCELLANEOUS, ETC.

"PROPELLERS"—3' (for small glider motors) $5.38; (Harley, Indian) $7.65; 4' 6" (Henderson) $9.95; 6' (Fords, Lawrence, Anzani) $11.98. Others. Correctly designed. Manufactured choicest laminated timbers. Copper tipped. Lightweight. Special finish—carefully balanced —vibrationless. No better performing "Props" made regardless of name, price, claim. Guaranteed. Yet cheap as the cheapest. Try one. Might trade. Free folder.—Earles, Hayes, So. Dakota.

"AIRCAMPER," new, tested. Cheap. Easy payments. Trade.—Earles, Hayes, S. Dakota.

"CORBEN BABY-ACE wing, new. Also Heath-Henderson, A-1. Instruments, materials, etc. Need typewriter, auto-radio, cash, etc.—Earles, Hayes, So. Dakota.

ELECTRIC TOY MOTORBOAT — Crosley one tube radio, Binoculars. Pictures free. What have you?—L. R. Hukill, 1484 W. Broad, Columbus, Ohio.

HOME STUDY aviation course, will sell for cash, cheap, or swap for what have you? My address—Alvin Jensen, Morlea Farm, R. 3, Albert Lea, Minn.

PROPELLERS for any light plane, new reliable. Consider aircraft material, prefer cash. Fords a specialty $12.50, Hendersons $10.00, etc. Builder long experienced. Write for estimates on others, state pitch, diameter and hub thickness.—Marshall D. Webber, Route 3, Jefferson, Ohio.

WANTED—Plans of transmitter and receiver for radio controlled gas model plane. Have Comp. air tank and motor, .22 single rifle and kits.—C. S. Wilson, 602 Bladsman, Clinton, Indiana.

"SWAP"—Magneto for Telescope.—E. Kwiatek, 143 Peter St., Buffalo, N. Y.

FOR SALE OR TRADE—Heath Super-Parasol, new cover, B-4 motor, Eaglerock less cover, OX-5, Cessena Primary Glider, Corben Baby Ace, Heath V, less motors—New Pietenpol, flyaway, others. Trade OX jobs, light cars.—Joseph Cooke, Findlay Park, Madison, Wis.

FIVE Aviation Books, sell or trade.—Horace Carver, Route 2, Horton, Ala.

AERIAL CAMERA—all metal, foreign built; less 25 cm lenses. Has 10x15 cm plate. Focal-plane shutter—"Time" to 1000th second. Accessories. Want a Graphic, Graflex or Leica, in good condition, cash, or what have you.—Howard Hasbrook, Madison Ave., Cedarhurst, L. I., N. Y.

MOTORS, ENGINES, ETC.

SELL OR TRADE—Gas model engine with tank, $5.00. Also all electric two tubes. Short wave Radio $3.00.—Paul V. Allen, 8 Highland Ave., Bethel, Conn.

FOR SALE OR TRADE—Five foot Stinson Reliant, good flyer doped. Five Dollars.—Stanley Keeler, 87 Milwaukee Ave., Bethel, Conn.

WANTED—Cash or trade: Harley and Indian motors, complete with magnetos. Must be in good condition and reasonable. Also steel tubing, bolts, shackles and cables.—Universal Aircraft Co., Ft. Worth, Texas.

AIRWHEEL tires and tubes to trade for small engine or Aviation Books, Magazines, Tire sizes 5.00x4, 10x3, 20x4, 14x3.—A. Jones, Box 30, Schertz, Texas.

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608 S. Dearborn St. Chicago, Ill.

Henri Mignet

(*Continued from page* 194)

It is true, that he does not hold a pilot's license, but he has been building and *flying* airplanes for fifteen years! Incidently, he has put in over 200 hours on the "Pou du Ciel" alone. Then, beside those fifteen years of practical technical experience (publicity to the contrary), he is the graduate of an engineering school. Therefore, we see that the "Pou du Ciel" is not merely the work of an inspired amateur. Unless we use the word "amateur" in its broadest sense.

Other reasons for the great popularity of the idea are obvious: it promises economy and simplicity of construction. In addition to that less tangible appeal, the satisfaction of being able to say that it is not necessary to be an engineer or even a clever mechanic nor to make difficult calculations . . . anybody can build this plane!

There are literally thousands of men and boys who have had years of experience building model airplanes, who have developed a high degree of manual skill. For these, the "Pou du Ciel" is just one more fascinating problem, with the added zest, that they can have the joy of actually learning to fly when it is completed.

As for the simplicity of construction and the danger of amateur workmanship, though critics of the idea admit, that anyone can build a "Pou," they insist that to really construct one according to Mignet's ideals, one must be more than an amateur. They say it is an error in psychology to believe that an untrained worker can faithfully follow instructions, or will not be tempted to add or change certain details.

Strange as it may seem, Mignet declares that this is exactly the opposite of what happens. The amateur knowing nothing of the principles of aerodynamics, will follow instrucions down to the last centimeter, while the flyer or skilled mechanic is tempted to "improve" on the model.

Those, who believe in statistics, quote the fact that, during the past year, ordinary sport aviation has had only one fatal accident in 4500 hours of flying, while the "Pou du Ciel" has been responsible for three deaths in less than 1000 hours. Possibly, this may be explained on the grounds that these accidents have occurred in machines that were not constructed exactly according to Mignet's formula. However, on the strength of these facts, one must admit that the "Pou" in its present form does not offer complete safety.

Mignet realizes that the accidents and failures on machines that are attempts to improve on his theory may prove disastrous to his idea. Therefore, though he is not satisfied that he has found the final solution, he has been forced to take out patents to protect his work.

We had the privilege of seeing a new model on which he has made some radical changes. If these prove successful, he will describe them in a revised edition of his book, which is to be published in the early part of this year.

Though there is a great flare for amateur construction at present, we have a feeling that even Mignet realizes, his little machine will have a better chance for success, if it can be constructed by technical experts and sold at a cost that will be within the reach of amateur-flyers. And, because there is a growing interest and demand of these midget planes, there has been an association formed which will construct these ships under Mignet's supervision.

There have been so many amusing stories connected with these amateur efforts, that a collection of them has been made and is to be published this month. The "Pous" are so small, they are being built in shops, garages, backyards and basements.

One wealthy Parisian woman turned her salon into a workshop and constructed one which she presented to her son as a Christmas present. (And there is a man in the U. S. A. who is building one for his mother-in-law. Ed.) But we think the most amusing tale is the one about the man who wished to surprise his friends, so built a "Pou" in his attic. Unfortunately, he didn't think about the problem of getting it out, after it was finished, and he had to make a hole in the side of the house to remove it.

There can be no doubt that the "Pou du Ciel" has caught the popular fancy. As one advocate of the "movement" points out, the French Government has spent more than sixty million francs in the past six or seven years to encourage flying, and yet there are only about 600 private-plane owners in France.

Now, in less than a year, Mignet by himself, has persuaded between 1,500 to 2,000 persons to make at home and at their own expense, 500 examples of this new machine. As he says, for this crowd of men and boys, it isn't a question of long flights, world records, or a mere diversion in the country; it is rather, a passionate desire to fly, to be in the air, not passively as in a balloon, but actively in command of a little craft.

At the beginning of the "movement," the technical services of the French government were distinctly hostile to the new formula of a movable wing or the idea of amateur construction. However, in the early part of 1935, the Minister of Air himself became interested in the campaign for light aviation, and toward the middle of the year, the State created a special certificate of navigation for the "Pou du Ciel" and similar lightplanes. Heretofore, they could only be flown on private land, but with this new certificate they may use the established airports, within certain limitations. They may also secure a special permit to fly cross-country.

It is this certificate, that has made it possible for Mignet to demonstrate his ship, though he does not hold a pilot's license. He made a tour of over 2000 miles throughout France last summer, and then flew the Channel and was wildly acclaimed all over England.

END.

Letters

(Continued from page 190)

be made to give a sharp well-defined print. We will now let Mr. Dunkle go on with his story.

I have been an interested reader of POPULAR AVIATION *for a good many years, but until now I have never been a contributor. However, you will find enclosed three panels of a 16-millimeter moving picture film.*

This is a shot of myself coming in for a landing on a 24-foot Irvin air chute at Lost Nation Airport, Willoughby, Ohio. It was taken last August from the air.

There is also a story connected with this jump that takes it out of the class of casual exhibitions and, as I have enough jumps to my credit not to be classed as a novice, I should really be ashamed to tell it.

We took off before a crowd of about 3,000 people about 6:00 P. M. *The ship was a Waco J.6 3-place open job with the door removed for easier exit. There was a pretty good breeze blowing for that late hour in the day, but the crowd had been waiting all afternoon so we couldn't put it off much longer.*

We climbed to 2,300 feet, got the drift and I climbed out on the wing to wait for the signal. It came and I went with enough allowance to drift me into the field or near it.

Well, I left the ship without my hand on the ripcord and with the best intention of opening the 'chute at once. I had no trouble locating the ring or I could have sworn is was nothing else, but as I'm a total abstainer I could only have seen one ring. Well, I flew through the air, cheerfully pulling ripcords, or somethin', that didn't seem to pull.

After nine hundred feet, and four good pulls, I decided that the auxilliary 'chute idea wasn't so bad at that. The front pack (I had two 24-foot Irvins) jerked me up at once. I worked like the devil trying to make the field but, inasmuch as I was traveling directly for some wires, I gave up my ambitions in that direction, sailed over them with a fifty foot clearance or less and landed right across the road like a ton of bricks.

The gentleman from whom I rented the 'chutes pulled the first ripcord ring out on the ground, it worked perfectly. I'd still like to know what I had hold of.

And so-o-o-o, he was pulling on the lapel of his coat or something else beside the ring of the ripcord! Those auxiliary 'chutes come in handy sometimes, you bet!

* * *

OUR medical men seem to be taking a profound interest in aviation this past year, and now we are delighted to reproduce a letter from Dr. P. A. Mullikin, 1323 Nothenius St., Texarkana, Texas, who makes interesting and pertinent comments on the various phases of aviation. We get a particularly big kick out of his reference to fool-proof planes and contemporary advertising. Dr. Mullikin, you now have the floor.

I am an aviation enthusiast, or one of the weaker souls that have succumbed to the sting, bite or subtle infection of the Aviation Bug. At least my infection is acute and the little relief I get is in the fleeting moments that I have my feet off the ground and touching rudder pedals.

I have studied aviation's bugaboo, the D. of A. C. rules, and all the advertising literature extant including POPULAR AVIATION'S *views. I glean that every plane is the last word in its class (judging from advertising matter) barring none, and fool-proof to a letter.*

*Yet, in the last year, I have seen with my own eyes two * * * * planes go the way of all flesh, or is it "spruce" in aviation's jargon?*

Now, to my inexperienced eye, the fault lay in a much too frail landing gear, for all the little ship did was spread its front paws out to the sides and stick its nose into the ever present earth.

*We admit that the damage was not more than could be expected in any plane that has had the misfortune to so land, but my contentions are to the effect that, after seeing two of these planes do the same trick (planes of current vintage) that there must be some mechanical or structural fault or weakness there. Of course I have only had the pleasure to see two * * * * in action and, as I have previously said, they were both washouts of course.*

Judging from past experience, if I had seen a hundred of these little ozone disturbers in action I would surely have that funny feeling every time I saw one land. Now get me right. I am not knocking one ship and in the next breath heralding the merits of another. I would like to know if there is a weakness in the landing-gear of this ship, and if there is, why in the name of the air-minded don't someone give this information to the general public or at least pass it along to the manufacturers. It seems that aviation magazines only print the good points and are adverse to constructive criticism. (They don't like lawsuits. Ed.)

To shift our inquiry to another plane. What is the Flying Flea and what are its merits, or is it like the rest—flawless? If it is, why did one of them make the Associated Press when it ground looped at Miami, Fla., with Ed Nirmaier. (It was blown over in a gale that also finished an Army Douglas OB. Ed.) Of course, it is easily understood that an auto never makes front page reading for an Associated Press dispatch unless it kills someone of national importance and, even if it were faulty brakes, or poor rubber, I doubt if the sales of that particular make of car would be affected thereby.

But aviation is still in its infancy (even if Douglas is building a 24-passenger, 2,000-horsepower air transport) and we are still wondering what makes the thing click. Well, we all know that even a Ford isn't safe in the hands of the inexperienced or reckless so barring that element, let's have some constructive criticism on the various merits of say Taylor "Cubs," Arups (that reminds me of my first sea voyage), Porterfield, Heath-Mid Wing, Aeronca, both ships; Hammond Y, and Rearwin Model 7000.

END.

Used Aircraft and Equipment

Now is your chance to buy a GOOD USED plane with an Aviation Products guarantee. Full details are immediately available on all planes listed. All planes subject to prior sale so write, wire, or phone at once if interested.

WACO 10—OX—5

WACO 10—3-POLB, OX-5 Curtiss Engine similar to above photographs. Total hours flown, 900. Flying time since last general overhaul, 90 hours. Has never been cracked up or damaged. Plane in general good condition. Now in dead storage but will be licensed. Standard instruments. Gardner wood propeller. New motor run 20 hours. Terms cash $360.00, flyaway. A REAL BUY.

FAIRCHILD KR. 21B

Fairchild KR 21B, powered with Kinner B5—125 H. P. motor 2-POLB. Excellent condition. Tot-l flying hours, 325; 20 hours since last overhaul. Gardner wood propellers, Oleo shock absorbers, brakes. Equipped with standard instruments for dual instruction. Licensed to October, 1936. A good buy for $1550.00. Prefer cash, but terms can be arranged.

LINCOLN P. T. KINNER

LINCOLN P. T. 2-POLB powered with Kinner K-5 engine of 100 H. P. Standard instruments. Gardner wood propeller. Licensed (license expires April, 1936). Total flying time, 675 hours. This airplane is practically new in appearance and condition and has but 10 hours flying time since last overhaul. The color of fuselage and wings is Azure Blue. Price $1200.00 cash flyaway, but terms can be arranged.

We also have for quick disposal numerous planes, including an American Eagle OX. 5 (Licensed) for $425.00 and a Warner Cessna (Licensed) for $1200.00. If the plane you want is not listed in our advertisements, write to us or see our nearest representative regarding your requirements.

SCINTILLA MAGNETO For CURTISS

Scintilla Magneto for Curtiss OXX-6 Motor. A-1 condition. Has connection for Booster Magneto. Priced low at $30 for quick sale.

WANTED

Miller Overhead Valve Actions. New and used. Complete and parts. Give price and details in first letter.

USED PARACHUTES. Must be in good condition and packed by licensed packer. Give price and condition in first letter.

USED PLANES of all types in good flying condition. Also a few crack-ups. We have several unsatisfied orders on hand. If you have a plane for sale, write or wire us immediately.

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